THE DEVELOPMENT OF A **FELDENKRAIS®** POSTURAL CONTROL PROGRAMME FOR PEOPLE WITH SPINAL CORD INJURY: AN ACTION RESEARCH STUDY

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Table of Contents

Table of Tables

Table of Figures

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Abstract

Aim

The aim of this study was to develop an **Awareness Through Movement®** based **Feldenkrais** programme for people with SCI and identify whether the programme could address some of the negative consequences of SCI.

Methods

For this study I used an action research process which comprised three main phases:

1. The development of a draft **Feldenkrais®** postural control programme in consultation with people with SCI, **Feldenkrais®** practitioners and literature on both SCI and the **Feldenkrais Method®**.
2. Evaluation of the programme delivery with a group of five people with SCI. Qualitative data were collected from participants and changes were made to the programme in response to participant feedback and practitioner-researcher reflections.
3. A pilot evaluation of the impact of the programme on five people with SCI. Evaluation was done via single case research studies, interviews and feedback during the programme. During this phase qualitative and quantitative was collected. Analysis was done at the individual and group level.

Key Results

My work with colleagues and clients in Phase 1 suggests that the approach I intended to use had face validity; it appeared to be effective. Phase 2 participants reported improved postural stability, ease of movement, body awareness and movement strategies after the lessons but felt they needed more frequent and ongoing lessons to sustain changes. Phase 3 participants reported and demonstrated sustained improvements in postural stability, ease of

movement and function; body awareness and movement strategies. Evidence of sustained improvements in postural stability was supported by the modified seated reach test with all five participants reaching further as a result of the programme. Improvements in seated reach still exceeded baseline at 3 week to 3½ month follow-up. Improvements in postural stability; ease of movement and function; and body awareness are consistent with other Feldenkrais studies.

Participants from both Phases 2 and 3 reported acquiring new skills and knowledge on how to expand their functioning and reduce some of the negative consequences of an SCI. They were motivated to continue with the **Feldenkrais Method** at the completion of the programme and felt that **Feldenkrais** should be used in rehabilitation immediately after an SCI. They found the lessons relevant to everyday functioning and the reduction of stress and pain and valued paying attention to the neglected parts of the body. There were no reports of any negative consequences from the lessons.

Conclusion

There is sufficient evidence that the programme has a defensible theoretical rationale and that it is feasible, safe and relevant for people with SCI. There is also preliminary evidence that it addresses some of the negative consequences of SCI, namely loss of postural stability, ease of movement and function, and loss of body awareness and that it provides participants with knowledge and skills to explore movement and manage their condition. This all suggests that further empirical testing is warranted. Replicating this study in other centres could enable stronger conclusions to be drawn.

Keywords: Feldenkrais, spinal cord injury, tetraplegia, paraplegia, quadriplegia, body awareness, proprioception, postural stability, balance, ease of movement, perceived exertion

Glossary

6-minute walking test. An exercise test that involves measuring distance walked in 6 minutes.

Accident Compensation Corporation. The New Zealand government organisation responsible for administering the country's accidental injury insurance scheme.

Action research. A method which aims to bring about change in an organisation, community or programme (action) and to increase understanding on the part of the client, researcher or both (research). Practitioners in the field can use action research as part of their normal activities.

Activities-Specific Balance Confidence Scale. A self-report questionnaire used to assess an individual's confidence in performing daily activities without losing balance.

Acute pain. Pain that has persisted for less than 12 weeks.

ASIA Impairment Scale. A scale used to define the neurologic extent of a spinal cord injury with ASIA A referring to a complete injury, ASIA B referring to an incomplete injury where sensory but not motor function is preserved below the neurologic level, and ASIA C and D referring to incomplete injury where some motor function is preserved below the neurologic level.

Awareness Through Movement®. Feldenkrais lessons (usually taught in groups). These lessons involve verbally guided movement explorations that focus on developing proprioceptive awareness and coordination.

Body awareness. An internal sense of the body.

Chronic pain. Pain that has persisted for more than 12 weeks without an apparent ongoing injury.

Cognitive Behavioural Therapy. A goal oriented therapy which challenges negative patterns of thought or behaviour in order to change undesirable behaviours or feelings.

Complete injury. A spinal cord injury where there is no sensory or motor function in the in the lowest segments of the sacrum.

Critical friend. A person with whom the researcher can work through some of the issues faced in their study. The critical friend is independent of the thesis committee.

Fatigue. A state of excessive chronic tiredness with a pervading feeling of exhaustion.

Feldenkrais Method®. A form of sensory motor education based on the principles of motor learning.

Fibromyalgia Impact Assessment. A test used to assess the current health status of people with fibromyalgia.

Functional Integration®. Feldenkrais lessons performed one-to-one with the client lying on a low padded table or bed. The practitioner uses his or her hands to guide the client through simple movements and postural changes.

Illness Perception Questionnaire. A scale used to assess cognitive and emotional representations of illness.

Incidence. The rate of new cases of a condition. It is generally reported as the number of new cases occurring within a period of time (e.g., per month, per year) and as a fraction of the total population (e.g., per million).

Incomplete injury. A spinal cord injury where sensory and/or motor function are preserved below the neurological level which includes the lowest sacral segments (S4-S5).

Modified Clinical Test of Sensory Interaction in Balance. A test designed to assess how well an individual is using sensory inputs for postural control when one or more sensory systems are compromised.

Motor Imagery. Imagining performing an action to improve motor function.

Modified Falls Efficacy Scale. A test used to assess risk of falling.

Neuropathic pain. Pain developing due to injury of the nerves themselves. It appears to occur spontaneously, i.e., without a definable stimulation. It is described as tingling, burning, electric shock-like, cold, pricking, pins and needles, squeezing, sharp, itchy, and/or shooting.

New Zealand Spinal Trust. A charitable trust that provides information, education, research, advocacy and support for people with SCI throughout New Zealand.

Nociceptive pain. Pain generated by the activation of nerve endings (nociceptors) in peripheral tissues. Nociceptive pain can be due to the initial trauma, muscle and joint overuse (for example, upper limbs and wheelchair use and injury-related muscle weakness), spasm, and contractures. It is often described as dull, achy, crampy, or throbbing and can be found in a number of tissues such as skin, muscles, tendons, bones, and ligaments.

Non-Traumatic SCI. A condition that is not caused by trauma or accident (such as a bacterial infection, blood clot, viral infection, tumour or congenital condition) that leads to loss of function of the spinal cord.

Patient Specific Functional Scale. A self-report, patient-specific questionnaire designed to assess functional change.

Prevalence. The actual number of cases alive with a condition during a period of time. It is reported as the number of cases and as a fraction of the total population (e.g., per million).

Posturo-Locomotion-Manual. A movement test that measures neurological movement disturbances.

Proprioception. Joint position sense which is sent via sensory neurons to the brain to inform the central nervous system about muscle length, and movement speed and load. Proprioceptive input creates awareness of the body's position in space, triggers spinal reflexes and prepares the individual for effective control of movement.

Reference movement. A movement based on everyday function that is performed before and after an ATM. The reference movement enables participants to observe any changes that may have occurred as a result of the ATM and see the relevance of the lesson to their daily lives.

Randomized controlled trial. An experiment designed to reduce bias by allocating participants to either a treatment group (receiving the treatment being investigated) or a control group (receiving standard treatment, no treatment or placebo).

Spasticity. A sensory motor disorder characterised by intermittent or sustained involuntary muscle activation.

Spinal cord injury. Damage to the spinal cord resulting in temporary or permanent loss of normal motor, sensory and autonomic function.

State Trait Anxiety Inventory. A psychological test measuring two types of anxiety – state anxiety (anxiety about an event) and trait anxiety (anxiety as a personal characteristic).

Traumatic spinal cord injury. An SCI caused by a trauma or accident.

Visceral pain. Pain resulting from activation of nociceptors in the abdominal, thoracic, or pelvic organs and tissues.

List of Abbreviations

6MWT. 6-minute walking test

ABC. Activities-Specific Balance Confidence Scale

ACC. Accident Compensation Corporation

ATM. Awareness Through Movement®

CBT. Cognitive behavioural therapy

FI. Functional Integration®

FIA. Fibromyalgia Impact Assessment

fMRI. Functional Magnetic Resonance Imagery

IPQ. Illness Perception Questionnaire

mCTSIB. Modified Clinical Test of Sensory Interaction in Balance

MI. Motor imagery

NTSCI. Non-traumatic spinal cord injury

NZST. New Zealand Spinal Trust

PLM. Posturo-Locomotion-Manual

PSFS. Patient Specific Functional Scale

RCT. Randomized controlled trial

SCI. Spinal cord injury

STAI. State Trait Anxiety Inventory

TSCI. Traumatic spinal cord injury

Chapter 1. Introduction

In this chapter I will give a brief introduction to my study and explain why it is important. I will then introduce myself and describe how my personal experience inspired me to do my PhD.

A Missing Link

I begin by reflecting on the autobiographical account of Matthew Sanford (2006) who had a spinal cord injury (SCI) as a result of a car accident at the age of 13. An SCI (more commonly known as paraplegia or tetraplegia) causes damage to the spinal cord leading to loss of sensory, motor, and autonomic function (Bonner & Smith, 2013). For Matthew, rehabilitation for his SCI felt intuitively wrong. The focus was on increasing strength in his upper body whereas he was interested in connecting with his whole body regardless of whether or not it would lead to functional gain. His doctors convinced him that any sensations in his paralysed area were not real, that any sense of connection to his lower body was of no value. He was discouraged from enjoying movement in his foot. The long term effect of his rehabilitation was a sense of inwardly "turning gray". Matthew refers to the area below his injury as the "silence" or "darkness" and writes:

> My rehabilitation made a mistake with the silence by focusing on the absence of light. It too quickly accepted the loss and taught me to wilfully strike out against the darkness. It told me to move faster rather than slower, push harder rather than softer. It guided me to compensate for what I could not see. Another course of action, however, is patience. Stop moving, wait for the eyes to adjust, allow for stillness and then see what's possible (Sanford, 2006, p. 127).

More than 12 years after his accident he began doing yoga which helped him to re-establish his connection with his lower body. This opened up a whole new world for him - "my *entire* body began whispering to me once again" (Sanford, 2006, p. 168). He gained strength and more suppleness than he ever imagined possible.

One of the effects of an SCI is loss of body awareness (an internal sense of the body) and the sense of bodily connectedness that most of us take for granted. This sense of connectedness is heightened with the improvement of proprioception which is critical in coordinating movement. Muscles have sensory neurons that are specifically designed to inform the central nervous system about muscle length, and movement speed and load. This input creates awareness of the body's position in space, triggers spinal reflexes and prepares the individual for effective control of movement. This is proprioception. Proprioceptive information is sent from the muscles into the spinal cord which in turn convey information to the brain and motor neurons (Institute of Medicine, 2005).

Decreases in proprioception have been associated with increases in pain (Byl & Melnick; Schwoebel, Friedman, Duda, & Coslett, 2001) and spasticity (Dietz, 2002). Loss of proprioception may result in people having negative feelings about their body (Sacks, 1998) and to regard their body as something alien or separate from themselves (Sullivan, 1996). Loss of proprioception is a significant consequence of SCI, yet it has frequently been overlooked in rehabilitation (Institute of Medicine, 2005). In Institute of Medicine (2005) Robert Schimke, Professor Emeritus of Biology, Stanford University writes:

> One of the defects of spinal cord injury not often discussed or appreciated is loss of proprioception. As a C5/6 quadriplegic, I have no sense of where my lower limbs are placed and a minimal sense of the positioning of my upper extremities...I expect that loss of proprioception is an important aspect of motor function and its return after

spinal cord injury is an important aspect of regaining function (Institute of Medicine, 2005, p. 134).

The most commonly administered forms of physiotherapy after SCI include mobility and fitness training and stretching and strengthening (Harvey, Glinsky, & Bowden, 2016). Little attention is paid to improving body awareness which is understandable in the months following the injury when the priority is to get the client as independent as possible. Practical improvements in function take precedence over improved sensation. However in the long term, improving sensation has the potential to improve quality of life but I found little attention paid to the loss of the body awareness in the academic research generally.

The Nature of Spinal Cord Injury

SCI is defined as "damage to the spinal cord caused by an insult resulting in the transient or permanent loss of usual spinal motor, sensory, and autonomic function" (Bonner & Smith, 2013, p. 224). Most recovery of function usually occurs within six months of injury and plateaus about a year after injury (Blackwell, 2001).

Having an SCI leads to a number of issues that have a negative impact on quality of life (Hammell, 2010). Issues of concern to people with SCI include pain (Bloemen-Vrencken, Post, Hendriks, de Reus, & de Witte, 2005; Guilcher et al., 2013; Hammell, 2010; Singh et al., 2010; van der Meer et al., 2017), spasticity (Bloemen-Vrencken et al., 2005; Hammell, 2010; Singh et al., 2010; van der Meer et al., 2017), fatigue, (Forwell et al., 2017; Hammell, 2010), the inability to sit unsupported which leads to difficulty performing daily living activities (Wadhwa & Aikat, 2016), falls which can lead to contusions, fractures, strains or lacerations (Boswell-Ruys, Harvey, Delbaere, & Lord, 2010), reduced ease and control of movement (Kilgore et al., 2001), depression, pressure sores (Guilcher et al., 2013; Hammell,

2010) and issues with bladder and bowel management (Hammell, 2010). There are many interconnections between these problems. For example, pain increases fatigue and pain and fatigue are increased by spasticity, depression, anxiety, reduced motivation, feelings of hopelessness and helplessness, urinary tract infections and prolonged sitting (Hammell, 2010). These issues impair independent living and are costly to treat (Singh et al., 2010).

The Feldenkrais Method®

The **Feldenkrais Method®** is a form of sensory motor education that is based on the principles of motor learning (Connors, Galea, Said, & Remedios, 2010). **Feldenkrais** is available in two formats: as individual sessions (**Functional Integration**® or FI) or as group classes (**Awareness Through Movement**® or ATM).

During FI the practitioner makes the client comfortable and reduces outside sensory stimulation so that awareness of internal processes (such as proprioception) can be enhanced and the opportunity for new learning is maximised. The practitioner uses his or her hands to guide the client through simple movements and postural changes. Through this process, the client has the opportunity to experience new postural configurations (Stephens, 2000).

ATM classes involve verbally guided movement explorations that focus on developing proprioceptive awareness and coordination (Connors et al., 2010). Unlike in exercise classes, people move within their comfort range and at their own pace without being goal oriented. The emphasis is on awareness and on learning to sense changes and differences (Bearman & Shafarman, 1999). In this way, it is thought that the biomechanics of the movement are reorganised so that movement is more efficient and requires less effort (Dean, Yuen, & Barrows, 2008) and thus they discover new and easier ways of moving (Laumer, Bauer, Fichter, & Milz, 1997). It also enables learning of principles of movement so that they can explore new movements in their own time. On the face of it, ATM requires more active

participation on the part of the client than FI and it can be done with many people at the same time. ATM is also less expensive for the client than FI and provides benefits such as more opportunity for independent exploration and learning from the experience of others. **Feldenkrais** ATM classes and FI are available throughout New Zealand.

The New Zealand **Feldenkrais** Guild (MNZFG) guides the professional development, quality and integrity of the **Feldenkrais Method** in New Zealand. It acts as the regulatory body governing the ethics and standards of practice. The Guild is a member of the International Feldenkrais Federation (IFF) which is represented in 17 countries. **Feldenkrais®, Functional Integration®** and **Awareness Through Movement®** are registered Service Marks of the New Zealand **Feldenkrais** Guild Inc.

The Relevance of Feldenkrais to SCI

Although the volume of research into the **Feldenkrais Method®** is growing, it is still a relatively new field. However the research to date has provided evidence of benefits that could help alleviate some of the issues that affect people with SCI. There is evidence that the method leads to decreases in pain (Lundblad, Elert, & Gerdle, 1999; Connors, Pile, & Nichols, 2011) and improvements in balance (Hillier, Porter, Jackson, & Petkov, 2010; Ullmann, Williams, Hussey, Durstine, & McClenaghan, 2010, 2010; Vrantsidis et al., 2009; Connors, Galea, et al., 2011). Studies have investigated the effects of the method on Parkinson's disease (Teixeira-Machado et al., 2015), stroke (Batson & Deutsch, 2005), multiple sclerosis, pain and the elderly (Hillier & Worley, 2015), however, to the best of my knowledge, this is the first research project in the world on the **Feldenkrais Method** and SCI.

In 2005 I began doing FI with people with SCI and found many anecdotal accounts of improvement. Clients reported improvements in movement and sensation and reductions in pain and spasticity. Many clients also reported that they enjoyed the lessons.

Although proprioception is important for balance and movement, I found that the majority of my clients did not know what proprioception was or the relevance of it before they met me. Many had been actively discouraged from paying attention to sensation. If they had any sensations that were considered impossible according to mainstream theory about SCI, the sensations were dismissed as just something in their imagination. Yet people who contacted me that had made good recovery from SCI talked about how important paying attention to the proprioceptive sense was to their recovery.

I found that even when functioning was improved, my clients seemed most excited by increased body awareness. This led to testimonials such as “It never ceases to amaze me how after one session with Cindy, I notice dramatic improvements in body awareness, often in places where I have little sensation or movement” (Claire Freeman, personal communication, October 2008). Testimonials from other people with SCI who had experienced **Feldenkrais** supported this point of view “Important for me, above all, was to learn to feel myself once more, although I have a complete loss of sensation. I could feel once more my feet and legs through pressure, movement, warmth and the orientation of my legs in space” (Michael Willems, personal communication, 2008). As one **Feldenkrais** practitioner with an SCI said, restoring body image is the first step (Ed Muegge, personal communication, 2008).

I have found that, as awareness is enhanced, clients experience a number of benefits such as a decrease in spasm. For example, I was working for the first time with a woman (diagnosed with complete paraplegia) who had continuous spasms in both legs. She told me that this happened night and day and kept her awake at night. She said she had no sense of where her legs were and could not feel them being touched. Within a minute of my using

touch, pressure, movement and visualisation to increase awareness of her right leg, she said her awareness in her right leg began to return. At the same time, the spasms in her right leg stopped. In the next session, we worked in the same way with her left leg and the spasms in her left leg reduced. Later, she told me the spasms never returned to their previous level.

I have also worked with a number of clients with persistent pain and have found that, by increasing awareness of the area around the muscle tension, the muscles are able to relax. For example, one client had constant tension and spasticity in her legs which was interfering with her sleep. I worked with her using very gentle pressure and movement to help clarify the sense of her legs and feet. She said it was amazing how the pain just melted away like magic. Two days later she told me that her legs still felt great and she'd had the two best night's sleep in ages.

I networked with people around the world who had an SCI and were using the **Feldenkrais Method** or were practitioners working with people with SCI. Some of the people with SCI had gone on to do the **Feldenkrais** training. A number of people had experienced significant benefits using **Feldenkrais** principles. For example, Kevin Hitchcock, who broke his neck at C3/4, was told he would never recover feeling below the neck or walk again. Despite this, he learned to walk and restore arm and hand function. He attributes much of this to **Feldenkrais** (Hitchcock, 1998).

Nottwil Paraplegic Centre in Switzerland (one of the largest spinal hospitals in the world) had been using **Feldenkrais** for over 10 years. According to Dr Markus Meyerhans, Head of Psychology, it was used there to enhance body image, coordination, breathing and stability and to reduce pain. Many clients reported on the importance of the method in their rehabilitation and physiotherapists also noticed that clients were better able to coordinate function after a **Feldenkrais** lesson (Dr Markus Meyerhans, personal communication, February 2, 2007).

People I spoke to also reported some negative consequences from mainstream rehabilitation. Common tools used in mainstream are passive stretching and splinting which are designed to improve mobility and reduce contractures. Although some people with SCI felt that these practices had been helpful, others were doubtful. For example, one client who had had his injury for over 25 years, told me he used to get drunk to tolerate the pain experienced from splinting. He eventually gave up the practice. Another client was left with his arms stretched above his head and tied up with a towel for about half an hour at a time. He said this was painful and lead to a deterioration in his body image.

Another tool used in mainstream rehabilitation is strengthening exercises. Although some people with SCI have found this helpful, others have told me that strengthening exercises have led to pain, spasticity and loss of mobility. Some physiotherapists I spoke to felt that strengthening exercises were not appropriate for people with SCI. A one size fits all approach was not working for everyone.

People I spoke to felt that many people with SCI could benefit from the **Feldenkrais Method**. For example, Andrew Hall, the CEO of the New Zealand Spinal Trust and with tetraplegia himself, wrote "I have also spoken to a number of other people with spinal cord injuries who have worked with her [i.e., me]. They report enjoying and benefiting from the sessions. I also have enjoyed my **Feldenkrais** sessions and the ensuing benefits. I believe that Cindy's work will be welcomed by many people with spinal cord injuries and other disabilities" (personal communication, August 2, 2010).

Feldenkrais is not practised widely in mainstream SCI services or funded by the Government so, although the above accounts are all anecdotal, they occurred frequently enough for me to consider further exploring the benefits of Feldenkrais with SCI.

Barriers to Practising Feldenkrais

From my observations there seem to be a number of barriers to people with SCI practising the **Feldenkrais Method**. Amongst these barriers are physical and financial constraints. I have found that working with people with SCI incurs more costs than working with able-bodied people. For example, you need wheelchair accessible premises and a wheelchair accessible bathroom. Frequently you need extra help in getting clients on and off the **Feldenkrais** table or bed; at times you need a hoist. Accommodation of these requirements means that the practitioner needs extra space in the premises. At the moment funding (such as the Accident Compensation Corporation (ACC)) is not available for alternative approaches such as **Feldenkrais** in New Zealand. This is a Catch-22. Without the funding, we are limited in what we are able to do for people with SCI. Without research it is difficult to attract the funding but research requires funding.

I have been unable to find documented cases of practitioners doing ATM with people with SCI. Most people with SCI cannot attend a public ATM in part because some classes are not wheelchair accessible and in part because of the nature of the lessons. Classes generally only cater to people who have a relatively normal sensory motor system and can walk. I contacted the **Feldenkrais** community widely to find if anyone had recorded any lessons that had been specifically developed for disabled people but I was unable to find any.

The Current Study

My study aimed to develop an **Awareness Through Movement®**-based **Feldenkrais** programme for people with SCI and identify whether the programme could address some of the negative consequences of SCI. I used an action research approach to develop and evaluate the programme. Ethics approval was provided by the University of Canterbury Human Ethics

Committee (HEC) (Appendix 1.1) and the Upper South Health and Disability Ethics Committee (Appendix 1.2).

Outcomes of SCI consumer surveys and focus groups (Bloemen-Vrencken et al., 2005; Hammell, 2010; Hammell, Miller, Forwell, Forman, & Jacobsen, 2009b; Singh et al., 2010) have been used to inform the objectives and design of this study. This is in line with the New Zealand Disability Strategy 2001 Action 10.3 which recommends using disability research to contribute to service development (Dalziel, 2001). In addition this study was run with input from people with SCI. This is in line with the New Zealand Disability Strategy 2001 Action 1.2 "Recognise that it is disabled people who are experts on their own experience" (Dalziel, 2001, p. 24). Two colleagues with postgraduate qualifications and SCI also reviewed the proposal for the study.

My Long-term Vision

My long term vision is to mitigate the barriers to practising the **Feldenkrais Method** for disabled people, in particular people with SCI. Aside from the financial and social benefits, my experience has led me to believe that ATM can be a useful adjunct to FI. Given that my clients have had months or years of being in the role of patient, I wanted to stay away from the rehabilitation paradigm where the emphasis is one-to-one clinical practice (DeJong & Wenker, 1979). By developing a programme of the ATMs for people with SCI, documenting the process and recording participants' experiences, I hope that my PhD is a step towards this.

In the Next Chapter

In this chapter I have introduced my study, the **Feldenkrais Method** and the background to my research. In the next chapter I will provide a narrative review of relevant literature on both the **Feldenkrais Method** and SCI.

Chapter 2. Literature Review

In the previous chapter, I introduced some of the issues facing people with SCI and how the **Feldenkrais Method** could potentially alleviate some of these issues. The purpose of this chapter is to provide a context for my study and to provide a background to some of the related studies. In this chapter, I will provide a background on the SCI secondary issues addressed in my PhD, specifically pain, spasticity, fatigue and effort, postural stability and body awareness. I will then outline the interventions that have been used to treat these issues and the **Feldenkrais** research that has addressed similar issues with other populations.

My Approach

For my PhD I did an initial scan of the literature, mainly for the purposes of the proposal. I searched PubMed, Psychinfo, Web of Science, CINAHL, the Cochrane library and Google scholar. I searched for articles on spinal cord injury (also tetraplegia, paraplegia, quadriplegia and SCI) and sensory motor education, movement education, proprioception, kinaesthesia, position sense, body schema, postural stability, coordination, pain and spasticity. During my literature search I came across the work of Karen Hammell, occupational therapist and academic. Her work was also recommended to me by Johnny Bourke, a fellow student with SCI. Dr Hammell has a partner with an SCI and has written extensively on disability and rehabilitation with a particular emphasis on the perspective of disabled people and the issues they face. She identified a number of secondary issues including pain, spasticity and fatigue. As these were all issues that the **Feldenkrais Method** had the potential to assist with, I then extended my search to include SCI and secondary issues, quality of life, pain, spasticity and fatigue. I also added to my collection of literature from articles I had already gathered on the **Feldenkrais Method** and articles and books recommended by friends. I then reviewed the **Feldenkrais** literature in relation to the identified issues. As there was very little research

literature on the **Feldenkrais Method**, my initial literature review covered most of what was available.

In the final stages of my PhD, I updated my literature search on the **Feldenkrais Method** from a review by Hillier and Worley (2015), a research list on the Australian **Feldenkrais** Guild website, a search of the **Feldenkrais** articles on the Zotero reference database, articles forwarded to me by colleagues and by searching the databases with the search term "Feldenkrais" for research articles relevant to my study. I also searched PubMed, Psychinfo, Web of Science, CINAHL, Cochrane library and Google scholar on spinal cord injury, tetraplegia, paraplegia, quadriplegia or SCI paired with other terms that I had identified as relevant to my PhD. These included (but were not confined to) incidence and prevalence, proprioception, kinaesthesia, body awareness, balance, stability, range of motion, reach, pain, fatigue, spasticity, fatigue, perceived exertion, locus of control, IPQ (Illness Perception Questionnaire), and participation.

Spinal Cord Injury

The spinal cord is a major conductor of motor and sensory information between the brain and body. Axons from neurons enter and leave the spinal cord via segmental nerves roots. The cervical spine contains 8 nerve roots which are named according to the vertebra above which they exit. For example, C1 exits above the first cervical vertebra. The thoracic spine has 12 and the lumbar spine has six distinct roots that are named according to the vertebra below which they exit. The sacred contains five sections that are fused into one structure with five nerve roots that exit via the sacral foramina. The spinal cord ends at approximately the first and second lumbar vertebrae level with the most distal part been called the conus medullaris. The cauda equina (a cluster of lumbosacral nerve roots) originate

in the conus medullaris and exit via the intervertebral foramen below their respective vertebral levels (Kirshblum et al., 2011).

Each nerve root receives sensory information via dermatomes (areas of skin) and innervates a myotome (a group of muscles). SCI affects the conduction of signals at the site of the lesion and the autonomic nervous system. By examining the dermatomes and myotomes, specialists are able to determine which segments of the spinal cord are affected by the SCI (Kirshblum et al., 2011).

Tetraplegia refers to loss of motor and/or sensory function of the spinal cord. It leads to impaired function in the arms, trunk, legs, and pelvis. Paraplegia refers to loss of motor and/or sensory function in the thoracic, lumbar or sacral (but not cervical) segments of the spinal cord. Arm function remains intact but the trunk, legs and pelvic organs may be impaired (Kirshblum et al., 2011).

Injuries are referred to as complete or incomplete. In an incomplete injury sensory and/or motor function are preserved below the neurological level which includes the lowest sacral segments (S4-S5). In a complete injury there is no sensory or motor function in the lowest sacral segments. Injuries are further graded according to the American Spinal Injury Association (ASIA) Impairment Scale which grades the severity or completeness of the injury as follows.

- ASIA A = Complete (no sensory motor function in the sacral segments S4-S5)
- ASIA B = Sensory incomplete (sensory function is preserved below the neurological level including sacral segments S4-S5. Motor function is not preserved more than three levels below the motor level on either side of the body.
- ASIA C and D = Motor incomplete. Some motor function is preserved below the neurological level.

- ASIA E = Normal. Sensation and motor function are graded as normal in all segments but the patient had prior deficits (Kirshblum et al., 2011).

SCI can be divided into traumatic (TSCI) or non-traumatic (NTSCI). Whereas TSCI refers to SCIs caused by a trauma or accident, non-traumatic NTSCI refers to other conditions that also lead to loss of function of the spinal cord such as bacterial infections, blood clots, viral infections, tumours or congenital conditions (Ministry of Health, 2017).

Incidence and prevalence.

In New Zealand about 1500 SCIs are TSCI, and less than 1000 SCIs are NTSCI and approximately 130 to 180 people are diagnosed with SCI (TSCI and NTSCI) each year. Eighty to 130 people receive specialist acute SCI services in ACC and health settings (Ministry of Health, 2017). The prevalence of TSCI in Australia as of 30 June 2011 ranged from 490 per million to 886 per million. The incidence ranged from 21 per million per year to 32.3 per million per year (New, Baxter, Farry, & Noonan, 2015). The prevalence rate of NTSCI in Victoria Australia as at 30 June 2010 was 367.2 per million. There were more males (197.8 per million) than females (169.1 per million) and the prevalence was much higher among those with paraplegia (269.3 per million) than with tetraplegia (97.8 per million) (New, Farry, Baxter, & Noonan, 2013).

In a systematic review of studies published between 1950 and 2012, New, Cripps, and Lee (2014) estimated that the global incidence of TSCI varied from eight to 246 cases per million per year. The global prevalence varied from 236 to 1,298 per million with prevalence rates increasing over the last decades (Furlan, Sakakibara, Miller, & Krassioukov, 2013). There are insufficient data to determine the global prevalence of NTSCI (New et al., 2014).

Having an SCI is expensive. In a study in the United States, Ma et al. (2014) estimated that in 2011, average per person yearly expenses ranged from $334,170 per person with an incomplete SCI in the first year post injury and $40,589 in each subsequent year. For

people with C1-C4 tetraplegia, the cost was $1,023,924 in the first year and $177,808 in each subsequent year.

Prognosis.

People with an SCI experience some recovery after the first clinical assessment, usually in the first three months after the injury but recovery can occur a year or more after the injury. These recoveries are considered “spontaneous”, although they are in part probably due to surgery, pharmacological treatments and physiotherapy. The extent of spontaneous recovery is significantly greater for incomplete lesions, with about 10% of persons diagnosed with a complete injury becoming motor incomplete within 12 months post injury. People with tetraplegia have demonstrated almost twice as many recoveries as those with paraplegia. However these improvements often refer only to the segments immediately below the lesion, and rarely bring functional benefits, such as independent standing and stepping. People with complete paraplegia subjects have a low probability of motor recovery after six months from injury; therefore an extremely low sample size will have sufficient power to examine the effects of a new intervention (six to eight participants). When longer periods have elapsed after the injury, (resulting in stable clinical conditions and less hospitalization) spontaneous recovery is rarer. Less than 2% of complete spinal cord injuries are reported to have become incomplete by the fifth year after the lesion. As a result, the number of participants with a chronic and complete lesion necessary to show a statistically significant motor gain due to some experimental therapy becomes even smaller (Taccola, Sayenko, Gad, Gerasimenko & Edgerton, 2018)

However a recent review has suggested that surprising levels of recovery are possible with some interventions. A key factor in recovery is the activity-dependent plasticity of spinal and supraspinal networks which can be triggered by electrical and pharmacological interventions. Repetitive training can facilitate the recovery of voluntary motor control.

Proprioceptive input to the spinal networks provides a template for reorganising spinal networks which play a leading role in the coordination of motor neurons needed to perform a given functional task. Repetitive exposure to task specific sensory input (such as occurs with repetitive training) can reshape spinal and supraspinal conductivity, and thus enable one to perform complex tasks years after the injury (Taccola et al., 2018).

The impact of SCI.

The impact that loss of sensory, motor and autonomic control has on activities of daily living is, for the most part, determined by the location and completeness of the injury. Generally people are independent in all self-care if their injury occurs at T1 or below. People with low cervical injuries may require additional bowel and bladder care and bathing with adaptive equipment, whilst people with high cervical injuries have an increased dependency and may need to use the mouth for functions such as typing and operating a power wheelchair (Ma, Chan, & Carruthers, 2014).

In addition to a reduction in independence, having an SCI leads to a number of secondary issues that have a negative impact on quality of life. In this section I will review some of those issues. The issues I will cover include pain, spasticity and contractures, fatigue, effort in movement and, impaired trunk stability as these are issues identified by people with SCI as being significant that have the potential to be addressed by the **Feldenkrais Method.** I have also included, loss of body awareness as this is a key issue addressed by the **Feldenkrais Method**.

Pain.

Pain can be a persistent consequence of SCI (Cardenas & Felix, 2009; Cruz-Almeida, Felix, Martinez-Arizala, & Widerstrom-Noga, 2009) and is one of the most common secondary consequences (Hatch, Cushing, Carlson, & Chang, 2018; Michailidou, Marston, De Souza, & Sutherland, 2014). Common locations of pain are the back, hips, buttocks, legs

and feet. Upper extremity pain is also common after injury particularly in people with tetraplegia (Turner, Cardenas, Warms, & McClellan, 2001). Pain after SCI is complex and the underlying mechanisms are poorly understood. It is further complicated by the psychosocial impact of the injury (Hadjipavlou, Cortese, & Ramaswamy, 2016).

Prevalence.

Although it is widely acknowledged in the SCI literature that pain is a common consequence of SCI, there is a wide variance of reported prevalence with rates ranging from 19% (van Gorp, Kessels, Joosten, van Kleef, & Patijn, 2015) to 96% (Dijkers, Bryce, & Zanca, 2009). However a recent systematic review by van Gorp et al. (2015) estimated that about half to two thirds of the SCI population has pain. It is estimated that about one-third of those experiencing pain have severely intense pain (Hadjipavlou et al., 2016). A study of 400 people, conducted at the Burwood Spinal Unit, Christchurch found the prevalence of chronic pain to be 85%. Of the 300 people who completed a survey, 15% reported chronic pain to be an extreme problem (Turner et al., 2001). The variability in reported prevalence has been attributed in part to the variety of pain definitions and classifications used (Michailidou et al., 2014; van Gorp et al., 2015).

Definition.

The International Association for the Study of Pain (IASP) defines pain as "an unpleasant sensory or emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (Hadjipavlou et al., 2016, p. 264). Pain is considered acute if it has been present for less than 12 weeks, and chronic if it has persisted for more than 12 weeks without an apparent ongoing injury (Hadjipavlou et al., 2016).

Classification of pain.

According to the International Spinal Cord Injury Pain (ISCIP) classification, which was arrived at by consensus from leading SCI and pain organisations, pain can be divided

into 4 types - nociceptive, neuropathic, other pain (e.g., fibromyalgia) and unknown pain (Finnerup, 2013).

Nociceptive pain.

Nociceptive pain is generated by the activation of nerve endings (nociceptors) in peripheral tissues. It is often described as dull, achy, crampy, or throbbing and can be found in a number of tissues such as skin, muscles, tendons, bones, and ligaments (Hatch et al., 2018). It is the most common type of pain for people with SCI and can be further divided into musculoskeletal, visceral or other pain (Finnerup, 2013). Nociceptive pain can be due to the initial trauma, muscle and joint overuse (e.g., upper limbs in wheelchair use), injury-related muscle weakness, spasm, and contractures (Hadjipavlou et al., 2016).

Musculoskeletal pain.

Musculoskeletal pain is common and can be due to trauma or inflammation in bones, joints, muscles, or other connective tissue; mechanical instability; muscle spasms; or overuse syndromes. In the case of musculoskeletal pain, the person must have some preserved sensation in the pain location (Hatch et al., 2018). Common locations include the shoulders (due to trauma, overuse, muscle weakness and/or spasticity), wrists, back (Finnerup, 2013) and arms. It is aggravated by continued use of the involved muscles and joints (Cruz-Almeida, Martinez-Arizala, & Widerstrom-Noga, 2005). The upper limbs are not designed for weight-bearing activity and frequent use in activity such as wheelchair transfers can cause stress on the joints (Cardenas & Felix, 2009).

Although it is acknowledged that musculoskeletal pain is common, overall prevalence rates are unclear. For example, Cardenas and Felix (2009) found prevalence rates ranging from 30% to 78%. A systematic review of the literature between 1990 and 2012, designed to determine the prevalence of chronic musculoskeletal pain in people with SCI, found that chronic musculoskeletal pain is not sufficiently reported in the literature. The authors found,

however, that nearly half of the people with SCI who have pain report chronic musculoskeletal pain (Michailidou et al., 2014).

Visceral pain,

Visceral pain results from activation of nociceptors in the abdominal, thoracic, or pelvic organs and tissues (Hadjipavlou et al., 2016; Hatch et al., 2018) and seems to be related to constipation. (Finnerup, 2013; Hadjipavlou et al., 2016). It is present in about 30% of people with long-term SCI (Finnerup, 2013).

Neuropathic pain.

The mechanisms of neuropathic pain are not fully understood and may vary from person to person (Finnerup, 2013). However it is thought that neuropathic pain occurs as a direct consequence of the effect that the injury has on the somatosensory system, i.e., it develops due to injury of the nerves themselves. It appears to occur spontaneously, i.e., without a definable stimulation (Hatch et al., 2018). It is described as tingling, burning, electric shock-like, cold, pricking, pins and needles, squeezing, sharp, itchy, and/or shooting (Finnerup, 2013) and can be felt at or below the level of injury (Finnerup, 2013; Hadjipavlou et al., 2016). It can develop immediately after the injury or after 1 year post-injury. (Hadjipavlou et al., 2016).

The prevalence rates of neuropathic pain are not clear from the literature with reported rates ranging from 30% (Hatch et al., 2018) to 80% (Kramer et al., 2017) of people with SCI. In a recent review of 17 studies involving 2529 people, prevalence rates were estimated to be at 53%, 19% for at-level neuropathic pain and 27% for below-level neuropathic pain (D. Burke, Fullen, Stokes, & Lennon, 2017).

Cited as the most “severe pain” post SCI, neuropathic pain is associated with statistically significant increases in the use of health care resources (Burke et al., 2017). It is

known to be chronic and resistant to many of the treatments currently available (Hatch et al., 2018).

Impact of pain.

Pain can be one of the most significant consequences of an SCI (Finnerup, 2013). In a large study examining patients' perceptions and dealing with the major consequences of SCI, it was rated as one of the top five difficulties (Hatch et al., 2018). Pain has a substantial impact on quality of life (Burke et al., 2017; Cardenas & Felix, 2009; Finnerup, 2013; Hadjipavlou et al., 2016; Hatch et al., 2018; Michailidou et al., 2014). It has been found to have a negative influence on emotional functioning (Burke et al., 2017; Cardenas & Felix, 2009; de Miguel & Kraychete, 2009; Hadjipavlou et al., 2016; Michailidou et al., 2014; Putzke, Richards, & Dowler, 2000), the capacity to perform cognitive activities (de Miguel & Kraychete, 2009; Mehta et al., 2013), mobility, physical health (Putzke et al., 2000) and sleep (Burke et al., 2017; Michailidou et al., 2014). This in turn affects participation in social (de Miguel & Kraychete, 2009; Putzke et al., 2000), recreational (de Miguel & Kraychete, 2009) and work-related activities (de Miguel & Kraychete, 2009; Meade, Barrett, Ellenbogen, & Jackson, 2006) and has a negative impact on economic self-sufficiency (Putzke et al., 2000). In a qualitative study investigating the experiences of 18 people with SCI pain, the participants described pain as the largest hindrance in their daily life. They described tiredness, exhaustion and fatigue as a result of their pain which limited them in both physical and mental performance. They had to take the consequences of their pain into account when planning any activity (Löfgren & Norrbrink, 2012).

Spasticity and contractures.

Spasticity is a sensory motor disorder characterised by intermittent or sustained involuntary muscle activation (Holtz, Lipson, Noonan, Kwon, & Mills, 2017). Spasticity can be elicited by a number of activities including changing body position (such as making a

transfer) or maintaining a stable body position (Fleuren et al., 2009). Factors that lead to an increase in spasticity include contractures, infections, pressure ulcers, pain, and psychological stress (Skold, 2000).

Spasticity typically interferes with physical functions such as ambulation, hand and arm control and bowel and bladder function. It can also limit range of movement, and lead to stress on muscles and joints (Hsieh, Wolfe, Miller, & Curt, 2008).

Prevalence of spasticity.

Around 65-78% of individuals with SCI experience spasticity with over 25% identifying it as a significant problem (Hsieh et al., 2008). In a study of 465 people admitted with traumatic SCI to major trauma and rehabilitation centres in Canada, the prevalence of spasticity at discharge was 65%. The prevalence of problematic spasticity (i.e., that required anti-spasticity medication) was 35%. At follow-up the reported prevalence of patients requiring spasticity treatment was 35% at 1 year, 41% at 2 years and 31% at 5 years post injury. Spasticity was found to interfere with function for 27% of people at one year, 25% at 2 years and 20% at 5 years post injury (Holtz et al., 2017).

Impact.

Spasticity can interfere with quality of life (Holtz et al., 2017; Milinis & Young, 2015). It has been found to have a negative effect on health (Noonan, Kopec, Zhang, & Dvorak, 2008), activities of daily living (Hsieh et al., 2008; Milinis & Young, 2015; Naro et al., 2017), employment (Hsieh et al., 2008; Meade et al., 2006), emotional well-being, interpersonal relationships (Mahoney et al., 2007), caregiving, sleep, sexual functioning (Adams et al., 2007) and social participation (Adams et al., 2007; Holtz et al., 2017; Naro et al., 2017). It can contribute to pain (Adams et al., 2007; Holtz et al., 2017; Saulino, 2014), falls, fatigue, low self-esteem, poor body image (Adams et al., 2007) and pressure ulcers (Holtz et al., 2017). In addition it leads to increases in the costs of medication and care (Hsieh

et al., 2008). Spasticity was found to be one of the top three factors interfering with therapy during SCI rehabilitation (Holtz et al., 2017).

However, there are some benefits from spasticity. It can be used to assist walking, standing (Naro et al., 2017) and transferring to and from the wheelchair (Holtz et al., 2017; Mahoney et al., 2007; Naro et al., 2017). It is seen as beneficial in the maintenance of muscle tone, muscle mass and circulation (Hsieh et al., 2008) and it can also alert people to the possibility that they have a urinary tract infection or other problem below the lesion (Holtz et al., 2017; Mahoney et al., 2007). Some people with SCI have reported that spasticity gives them a sense that something is "going on" in the affected region (Mahoney et al., 2007). Because of the benefits, some people state that they would not want to get rid of their spasms, but would prefer to gain control of them (Mahoney et al., 2007).

Fatigue.

Another of the secondary consequences of SCI is fatigue which has been defined as "a state of excessive chronic tiredness and a pervasive feeling of exhaustion" (Craig, Tran, Wijesuriya, & Middleton, 2012, p. 205). The excessive and chronic nature of fatigue distinguishes it from "tiredness" resulting from daily physical or mental exertion (Craig et al., 2012). Around 57% of people with chronic SCI have sufficient fatigue to interfere with function (Hammell, Miller, Forwell, Forman, & Jacobsen, 2009a).

In a study comparing fatigue in 41 community-dwelling adults with SCI compared to 41 able-bodied controls after completing a 2 to 3 hour session of cognitive tasks requiring constant concentration, the SCI group was found to have significantly elevated levels of fatigue. Data suggested that about 56% of the SCI group had excessive chronic fatigue levels compared to 29% in the controls; around 51% had depressive mood (compared to 19% in the controls), and around 36% had poor self-efficacy (compared to 15% in the controls) (Craig et al., 2012).

Dimensions.

Fatigue appears to have three dimensions: cognitive, emotional and physical. The cognitive dimension is experienced as being overwhelmed by the need to plan everything and use the body differently. The emotional dimension stems from the frustration of being physically unable to do things which can contribute to depression which can lead to fatigue. Physical fatigue is a result of weakness and the need to change position and deal with muscle tension, paralysis, pain and unpleasant physical sensations such as pins and needles (Hammell et al., 2009a).

Impact.

Being fatigued can lead to an increased chance of errors when performing cognitive-behavioural tasks, reduced motivation to be active, reduced social participation (Craig et al., 2012; E. M. Smith et al., 2016), anxiety, confusion and negative thinking that leads to further reduced motivation (Craig et al., 2012). Being fatigued means that people are limited in how much they can do. This means they often don't get to do the things they enjoy and motivation decreases which leads to increased depression and fatigue (Hammell et al., 2009a).

A matched group design studying the impact of fatigue on health-related quality of life (HR-QOL) after SCI compared 41 community living people with SCI to a group of 41 able-bodied controls. The people with SCI had significantly lower HR-QOL. Fatigue was more prevalent in the SCI group, and was associated with lower HR-QOL in both groups (Wijesuriya, Tran, Middleton, & Craig, 2012).

Contributing factors.

Factors contributing to fatigue include pain, depression and anxiety, side-effects of medication, sleep problems, secondary issues such as spasticity and urinary tract infections, posture, diet and the effort required to accomplish routine tasks (Hammell et al., 2009a).

Perhaps one of the factors that contribute to fatigue is the changes to the muscle fibre type. Tonic muscle (type 1) fibres are used primarily for posture control. They contract and relax slowly and are resistant to fatigue. In contrast, phasic muscles fibres (type 2) are generally responsible for producing movement and fatigue quickly (Whittle, 2007). After SCI, tonic fibres in paralysed muscles change to become phasic fibres (Burnham et al., 1997) and postural stability is impaired (Chen et al., 2003). A number of studies have shown that people with SCI try to compensate for the loss of postural muscle function by using non-postural muscles (Chen et al., 2003), i.e., those muscles that are prone to fatigue.

Effort in movement.

As mentioned above one of the factors that contributes to fatigue is the effort required to accomplish everyday tasks. Having an SCI means that more effort is required to perform everyday activities. A cross-sectional study compared the energy expenditure in walking of people with SCI compared to able-bodied comprised 45 people with SCI (who were able to walk either with or without walking aids or orthotics) and 21 able-bodied participants. It was found that the mean energy expenditure/m of SCI participants was 4 times higher than that of able-bodied participants ($p < 0.001$) (Vosloo, Ntsiea, & Becker, 2016). Other terms also used to describe effort include perceived exertion and ease of movement. These are influenced by mobility and function.

Impaired trunk stability.

One of the issues that affect everyday living for people with SCI is impaired trunk stability. Other terms for this include postural stability, postural control, trunk stability, and trunk control. This affects sitting balance, or the ability to sit and move in many directions from the seated position. This ability is reduced in individuals with SCI who have paralysis of the abdominal and lower back muscles compared to able-bodied individuals (Gauthier et al., 2013). According to Gagnon et al. (2009), the majority of people with SCI experience

sensory motor impairments of the trunk which have a negative effect on trunk stability. Being able to sit unsupported is important for people with SCI as they need to perform many of their activities of daily living from the seated position (Boswell-Ruys, Harvey, Barker, et al., 2010). One needs to have adequate trunk stability to perform functional movements with the upper limbs (Reft & Hasan, 2002; Seelen et al., 1998; Sprigle, Maurer, & Holowka, 2007) including efficiently propelling the wheelchair and performing other wheelchair related activities. Inadequate stability can also exacerbate the development of upper limb issues such as shoulder joint problems (Gagnon et al., 2009). In a review of the effect of trunk impairments on manual wheelchair propulsion, Gagnon et al. (2009) recommend that more attention be paid to the development of therapeutic interventions aimed at improving trunk stability.

Having adequate trunk stability is also important to prevent falls from wheelchairs (Gagnon et al., 2009; Thompson & Medley, 2007) which are common in people with an SCI who are wheelchair dependent. According to Boswell-Ruys, Harvey, Delbaere, et al. (2010) about 40–60% of people using manual wheelchairs report falls and falls represent 60–80% of the non-fatal accidents in wheelchair users. It may also influence the effort required to perform daily functions. A custom girdle, designed to provide trunk stability and abdominal support was found to reduce the sensation of respiratory effort in 10 patients with SCI (injury level, C5-T6) (Hart et al., 2005).

Loss of body awareness and proprioception.

Body awareness (an internal sense of the body) is influenced by proprioception and, as mentioned in Chapter 1, its relevance has been traditionally overlooked in rehabilitation (Institute of Medicine, 2005). However, in recent years a few authors have brought attention to the importance of accurate body awareness for healthy functioning.

According to Lenggenhager, Pazzaglia, Scivoletto, Molinari, and Aglioti (2012), the basic foundations of the self are situated in the brain systems that represent the body. In their study of 30 people with SCI and 16 healthy controls, they evaluated depersonalization (i.e., the feeling that one's experiences are detached, distant, not one's own, or somehow lost) and body ownership. They found higher levels of depersonalization in people with SCI indicating increased detachment from their body and internal bodily sensations. There was decreasing global body ownership with higher lesion levels. They concluded that disconnection of somatomotor inputs to the brain due to spinal cord lesions could resulted in a disturbed sense of an embodied self.

Scandola et al. (2017) examined bodily misperceptions in 49 people with SCI. They used a battery of tests to explore a variety of body related feelings and found six different types:

1. Body loss - sensations of body parts disappearing and missing;
2. Body part misperception - the feeling of having some body parts in a position which is different to the actual position;
3. Somatoparaphrenia-like sensations - the feelings that body parts are ‘‘alien” or detached from the body;
4. Disownership-like feelings - the feeling that body parts do not belong to the person;
5. Illusory motion - sensations of motion that are not voluntarily controlled and muscular fatigue after illusionary movements; and
6. Misoplegia - aversive feelings towards a given body part.

All these except Misoplegia were affected by clinical variables such as pain, lesion completeness, lesion level and length of time since lesion. They concluded that

somatosensory input and motor output may be necessary to build and maintain a typical self-body representation.

Lack of proprioceptive feedback has been found to compromise the success of locomotor training (Hannold et al., 2006; Kakebeeke, Roy, & Largo, 2006). For example, in a study of the experiences of eight people with SCI undergoing locomotor training, participants reported frustration with lack of proprioception, spasticity and loss of bodily control (Hannold et al., 2006).

Malik, Cote, and Lam (2017) explored the effects of sensory motor integration of visual and proprioceptive inputs on obstacle crossing, an important component of skilled walking. In their study, 15 ambulatory people with SCI and 15 able-bodied controls were required to step over an obstacle under full and obstructed vision conditions. Gaze behaviour, toe kinematics relative to the obstacle and bilateral hip and knee proprioceptive sense were assessed. They found that the individuals with SCI relied more heavily on vision and showed impairments in key gait parameters required for obstacle crossing. They concluded that proprioceptive deficits should be considered in rehabilitation programmes that aim to improve functional mobility in ambulatory people with SCI.

Interventions

Interventions to deal with the secondary consequences of SCI can be divided into three broad groups: impairment-related interventions, learning-based interventions and exercise. These are described briefly below.

Impairment-related interventions.

Conventional impairment-related approaches to pain include medications (Song et al., 2017), surgery (Hadjipavlou et al., 2016), neuro-stimulation techniques (Hadjipavlou et al., 2016; Mehta et al., 2013) and surgery (Meyers, Andresen, & Hagglund, 2000). Alternative

approaches to the management of pain include osteopathy (Mehta et al., 2013), massage (Felix, 2014) and acupuncture (Mehta et al., 2013; Saulino, 2014).

Impairment-related approaches to management of spasticity are based on the need to find a balance between the useful and detrimental effects on a person's quality of life. Generally the most conservative techniques are tried first, starting with physical rehabilitation approaches (including stretching, strengthening and splinting to maintain continuous application of muscle stretch) and progressing to pharmacological interventions and injections and finally tendon lengthening and transfer surgery (Adams & Hicks, 2005). Medications include spasmolytics, such as baclofen or methocarbamol (Hadjipavlou et al., 2016). Transcutaneous electrical nerve stimulation (where an electric current is used to stimulate the nerves) (Saulino & Averna, 2016) and botulinum toxin may also be useful therapies in the management of spasticity.

Traditionally postural instability has been thought to be caused by muscle weakness and thus has been treated with muscle strengthening. However, in a study of people with SCI, Chen et al.(2003) found that trunk strength is not a predictor of stability and recommended postural control training (a learning-based intervention) as a more appropriate intervention for instability (Chen et al., 2003).

Learning-based interventions.

Learning-based interventions involve participants learning a new skill. These include psychological approaches to pain such as cognitive behavioural therapy (CBT) (Eccleston, Hearn, & Williams, 2015; Felix, 2014; Mehta et al., 2013) postural control training (Boswell-Ruys et al., 2009), Tai Chi (Tsang et al., 2015), locomotor training (Behrman, Bowden, & Nair, 2006), robotic overground gait training (Triolo et al., 2009), virtual reality (VR) therapy, (Khurana, Walia, & Noohu, 2017; Tak, Choi, & Lee, 2015) and some elements of physiotherapy which aims to increase self-efficacy, activity and normal participation

(Hadjipavlou et al., 2016) and to address abnormal posture and gait which contribute to pain (Hadjipavlou et al., 2016; Saulino & Averna, 2016). These approaches can be used in conjunction with pharmacological approaches (Mehta et al., 2013).

Although there are no standard guidelines, typical postural control training involves challenging patients to reach and move in different directions from the sitting position (Boswell-Ruys et al., 2009) or task-specific training which involves intensive repetitive practice of specific activities of daily living from an unsupported sitting position (Boswell-Ruys, Harvey, Barker, et al., 2010). Whether or not task-specific training is a valuable addition to conventional rehabilitation is debatable. A systematic review of the effectiveness of task-specific rehabilitation interventions concluded that task-specific training can improve sitting and standing balance but the random controlled trials (RCTs) reviewed indicated that it did not appear to enhance the benefits beyond what was achieved from conventional physical therapy (Tse, Chisholm, Lam, & Eng, 2018).

An RCT with 30 people with chronic SCI evaluating the effectiveness of task-specific training provided initial support for the use of this intervention, although it is unclear whether the size of some of the treatment effects would be considered worthwhile. The authors suggested that a likely explanation for the improvements may be that the participants learnt new "compensatory" strategies to position their centre of mass over their base of support (e.g., by moving the head) in subtle, and not so subtle, ways (Boswell-Ruys, Harvey, Barker, et al., 2010).

An RCT with a group of 32 people with recently acquired paraplegia examined the effectiveness of a six week (approximately 45 minutes, three times a week) task-specific training programme. The authors found that there was no benefit. However they suggest that it is possible that more intensive training may have produced an effect but could not envisage any rehabilitation facility devoting more than what was provided in the study, given the

amount of therapist time involved. In addition to this, some participants complained that the training was boring and repetitive, despite the many different exercises included in the programme. The authors state that effective motor retraining requires repetitive practice which many people find difficult to tolerate (Harvey et al., 2011).

In a study on the impact of Tai Chi, participants with SCI were divided into two groups according to their preferences: the Tai Chi group (n= 11) who took part in sitting Tai Chi sessions (90 minutes/session, 2 times/week for 12 weeks) and a control group (n = 8) who were involved in educational talks and social activities of equivalent duration and frequency. Significant improvements were identified in dynamic sitting balance for the Tai Chi group but not for the control group (Tsang et al., 2015).

Some people have been able to improve their walking using locomotor training (Behrman, Bowden, & Nair, 2006). Locomotor training combines repeated practice of complex gait cycles with treadmill training and bodyweight support; and bodyweight support systems that involve manual trainers or robotics. Locomotor training aims to improve sensory motor function and walking in people with SCI (Mehrholz, Kugler, & Pohl, 2008; A. C. Smith & Knikou, 2016). Recent studies have found that locomotor training leads to reorganisation of spinal neuronal networks coinciding with improved motor function and decreased muscle co-contractions (Smith & Knikou, 2016).

Recent technological advances have brought about the advent of VR therapy which appears to be more effective than more traditional types of therapy. In a study to determine whether there is any difference between VR training and task-specific balance training in improving sitting balance and functional performance, 30 people with paraplegia as a result of a traumatic SCI were randomly assigned to two groups - the VR group and a task-specific balance training group (45 minutes, 5 times a week for 4 weeks). Balance and functional performance improved significantly for the VR group compared to the task-specific balance

training group as measured by the modified Functional Reach Test (mFRT), the T-shirt test, and the self-care component of the Spinal Cord Independence Measure-III (SCIM-III) (Khurana, Walia, & Noohu, 2017). In an RCT to investigate the effect of VR training using Nintendo Wii on sitting balance people with SCI, 26 participants with ASIA scale category A or B were randomly allocated into a VR group or a control group. Both groups attended conventional rehabilitation (60-90 minutes per week for 6 weeks). The VR group also completed 6 weeks (90 minutes per week for 6 weeks) of Nintendo Wii-based VR balance training. Both groups showed significant improvement in static and dynamic balance ($p<.05$). However the VR group showed significant improvement compared to the control group as shown by anterior-posterior (AP) and total postural sway distance ($p<.05$); AP and total postural sway velocity ($p<.05$); left, front and right mFRT ($p<.05$); and the T-shirt test ($p<.05$) (Tak, Choi, & Lee, 2015).

A small number of authors have also paid attention to the importance of using motor imagery (MI) (whereby a person imagines performing an action) to improve motor function. Cramer, Orr, Cohen, and Lacourse (2007) report that abnormalities in brain system function are present after SCI and could have a negative impact on restorative interventions. They found that MI improved speed of movement in non-paralysed muscles and increased activation in the left putamen (an area associated with motor learning) (as demonstrated by fMRI) during attempts to move a paralysed part (in this case, the foot). They suggest that the use of MI could be a valuable component of any intervention. However they point out that some participants in their study became fatigued which, they say, may be an indicator that their mental fitness needed to be improved.

According to Mateo et al. (2015) there is a growing interest the potential of MI to recover functional grasping in people with tetraplegia. The mental representation of an action without physical execution of the action enables active stimulation of brain motor areas. In a

literature review of MEDLINE articles they selected 10 studies of 34 participants with C4 to C7 tetraplegia and 22 healthy controls assessing the effect of MI intervention in individuals with complete tetraplegia, published in the last 15 years. They found that MI improved reach to grasp performance by improving grasp and muscle strength, decreasing movement time and trajectory variability and reducing abnormally increased brain activity.

There appear to be very few studies that focus on increasing proprioceptive or body awareness and those that do exist seem to be confined to improving walking such as the Qaiser (2017) study. Qaiser (2017) used a pre-post study with 13 people with incomplete SCI (of at least 9 months duration) and 10 able-bodied participants to test the effects of a robotic-based protocol to train the proprioceptive sense in the legs. In their study walking performance was determined by participants' accuracy in matching their heel position during the swing phase of walking to a virtual target presented on a monitor. Proprioceptive sense was assessed by knee joint position sense. They found the training to be effective with a significant improvement in knee joint position sense post-training and 24 hours later. There was also a slight trend in improvement in walking performance. They concluded that it is possible to improve lower limb proprioceptive ability following sensory training and that these improvements could further improve walking performance.

Exercise.

There is evidence to support the benefits of physical activity for people with SCI and surveys of people with SCI have revealed that opportunities for exercise, physical activity and recreation are highly desired activities (Crane, Hoffman, & Reyes, 2017). Research has shown that physical activity has led to a number of benefits for people with SCI including improvements in physical health, psychological well-being and quality of life (Burke et al.,

2018). According to Saulino (2014) a general exercise programme also has the potential to improve conditions such as spasticity, muscle atrophy and bone health.

The impact of exercise on pain has not been extensively tested (Felix, 2014) although some studies suggest that an exercise programme could reduce pain complaints (Saulino, 2014) and for neuropathic pain, it is thought that regular exercise reduces perceived pain, leading to a reduction in stress and depression (Hadjipavlou et al., 2016). For example, in a study to investigate the effects of an intensive exercise programme on SCI pain 13 (8 of whom reported pain) wheelchair-dependent people with a thoracic or lumbar SCI took part in a 10-week programme (three times weekly). For those with neuropathic pain (n=8) median pain intensity ratings decreased from 5 to 3 (on a 0–10 rating scale). For those with musculoskeletal pain (n=5), median pain intensity ratings decreased from 4 to 0 (Löfgren & Norrbrink, 2012).

In a pre-test/post-test study examining the benefits of a structured group exercise programme, 89 people with SCI took part in a twice weekly physical therapy group exercise class over three months. Forty-five participants completed pre- and post-participation interviews which revealed a decrease in mean pain and depression scores. Participants commented on the pleasure and confidence they derived from both the exercises and working with peers (Crane et al., 2017). Other studies have shown that targeted programmes for shoulder pain have been successful (Felix, 2014; Saulino & Averna, 2016).

Oliveira et al. (2016) conducted a quasi-experimental translational study with pre- and post-measures to determine the effects of the Spinal Cord Injury and Physical Activity in the Community (SCIPA Com) intervention on leisure-time physical activity and associated outcomes among participants with SCI. In their study, exercise professionals in the community were trained to work with people with SCI. Following that 64 people with SCI completed physical activity programmes under the guidance of these professionals. The

intervention included supervised physical activity twice a week for 30 to 60 minutes for 8 to 12 weeks performing moderate intensity endurance and strength training, flexibility, balance and proprioceptive exercises. As a result, compared to baseline there were significant improvements in leisure time physical activity, self-esteem and overall quality of life (de Oliveira et al., 2016).

Intervention issues.

The management of an SCI is challenging and complex. Pain after SCI is difficult to treat (de Miguel & Kraychete, 2009; Finnerup, 2013) with few studies indicating effective treatment options (Siddall, 2009). Pharmacological interventions can have adverse effects and many individuals are concerned about the long-term consequences of using medications (Mehta et al., 2013). A Swedish qualitative study examining the strategies used by 18 people with neuropathic pain following SCI found that participants resisted using pain-medication. They felt they were liberally prescribed yet they found they had limited or no effect on pain and led to unwanted side effects such as hallucinations or feelings of being unfocused or high (Löfgren & Norrbrink, 2012). Löfgren and Norrbrink (2012) found that people often requested complementary approaches to managing pain but they described a lack of support from the healthcare providers for non-pharmacological treatments.

There is very little literature on the physical treatment of spasticity and some have questioned the effectiveness of physical approaches (Adams & Hicks, 2005). According to Adams and Hicks (2005) medication has potentially serious side-effects and the results of the tendon lengthening and tendon transfer surgery are variable and unpredictable. A Cochrane Library review of the effects of stretching on contractures found that stretch had little or no effect on pain, spasticity, activity limitation, participation restriction or quality of life. Possible side effects from stretching include pain, and skin redness or breakdown (Katalinic et al., 2010). Another Cochrane review on the effect of passive movements (one of the

treatments for spasticity) found that there was insufficient evidence to permit any firm conclusions about its effectiveness in the treatment of a number of symptoms including spasticity (Prabhu, Swaminathan, & Harvey, 2013).

Little is known about how to manage fatigue after SCI (Hammell et al., 2009b). Although there has been progress in treatment of fatigue using drug and exercise based approaches (Craig et al., 2012), interventions such as drugs and exercise may actually increase fatigue (Hammell et al., 2009b) and there is a shortage of studies exploring the efficacy of psychological treatments (such as CBT or mindfulness) for fatigue in neurological disorders (Craig et al., 2012).

The benefits of exercise of may not persist if regular exercise is discontinued (Saulino, 2014) and despite the potential benefits to individuals with SCI, exercise participation rates are low in this group (Burke et al., 2018; Crane et al., 2017; de Oliveira et al., 2016). Crane et al. (2017) stated that, in their study, it was not known whether the improvements were maintained after programme completion and ongoing barriers can restrict regular participation in physical activity (Burke et al., 2018).

Barriers to participation include pain, fatigue, spasticity, muscle weakness, a need to conserve strength and energy (Lundstrom et al., 2017), a lack of accessible fitness facilities, unaffordable equipment and gym memberships, an absence of personal assistants with knowledge about SCI-specific exercise programmes and fear of injury (Crane et al., 2017). A systematic review which explored the factors influencing participation in physical activity in people with neuromusculoskeletal conditions reviewed 15 qualitative studies published between 2003 and 2013. Factors identified included lack of walking stability, muscle weakness, pain, stiffness, bladder and bowel issues, depression, temperature regulation difficulties, fear of injuring themselves, fatigue, accessibility, costs, transport and a lack of knowledgeable health professionals. People lacked motivation and felt self-conscious and

embarrassed in public, anxious, frustrated and angry. The authors concluded that the barriers to participation are unique for each individual and that it is necessary to design individually tailored interventions (Newitt, Barnett, & Crowe, 2016). According to de Oliveira et al. (2016) few studies have attempted to engage the community or address barriers such as accessibility, affordability and professional assistance.

Developing effective interventions.

An SCI affects the lives of not just the people with the condition but many others around them. Delivery of services to people with SCI is important in determining quality of life. The ACC is the New Zealand government organisation responsible for administering the country's accidental injury insurance scheme. It provides support for TSCI which can include up to 80% of preinjury earnings, equipment, house modifications and home help. However people with NTSCI are not covered by ACC but may have access to some health services and means tested benefits (Sullivan, Derrett, Paul, Beaver, & Stace, 2014). In 2012, ACC and the Ministry of Health worked with clinicians, management, community representatives and people with SCI to review New Zealand's SCI services and develop a national implementation plan to improve them. The outcome of this project was the New Zealand Spinal Cord Impairment Action Plan (2014-2019) (Ministry of Health, 2017). One of the aims of the plan was to provide the best possible health and well-being outcomes for people with SCI. In order to achieve this, they recognised that services need to be tailored to meet the physical and emotional needs of people with SCI (ACC & The Ministry of Health, 2014).

When I began my PhD, although there had been a substantial volume of research into SCI, there were still significant gaps in knowledge and few interventions had an adequate evidence-base. One of the reasons for the knowledge gap may have been that traditionally researchers had undertaken studies according to their own priorities and perspectives. Considerable effort had gone into developing models of risk, obtaining demographic data and

determining prevalence of secondary issues, without the development of appropriate interventions (Hammell, 2010) and measurement tools, such as quality-of-life measures, had been developed from the perspective of able-bodied people (Hammell, 2006). The importance of giving weight to the consumer perspective was highlighted in the measurement of spasticity. Examiner-based assessment of spasticity did not correlate well with self-report (Adams, Ginis, & Hicks, 2007; Lechner, Frotzler, & Eser, 2006), whereas self-assessment had been found to be more sensitive and relevant to daily life (Adams et al., 2007). Self-assessment of spasticity was recommended (Adams et al., 2007; Hammell, 2010).

It is important to take into account the knowledge and preferences of people with SCI. A Swedish qualitative study examined the experiences of 18 people with SCI pain who had undergone pain management at five different hospitals. It found that the participants felt that few health professionals respected their experience of living with pain and their wishes in regard to pain management (Löfgren & Norrbrink, 2012). One of the ways in which we can gain more knowledge and increase the effectiveness of interventions is by involving people with SCI (consumers) in the research process (Hammell, 2010). Consumer involvement in research is widely recommended as consumers have an experience of a condition that is not available to most researchers (Hannold, Young, Rittman, Bowden, & Behrman, 2006; Hewlett et al., 2006). Evoking consumer input when designing interventions increases the likelihood that the complex issues are addressed (Hammell, 2010). Incorporating the consumer perspective was an objective of the New Zealand Disability Strategy which aimed to enable disabled people to reach their potential and participate fully in the community. The New Zealand Disability Strategy was developed with extensive input from disabled people (Dalziel, 2001).

I was unable to find many studies that reviewed those approaches that people with SCI found most helpful. However I was able to find some small qualitative studies (Löfgren

and Norrbrink, 2012); Hammell et al., 2009b). Approaches to the management of pain that the participants of the Löfgren & Norrbrink (2012) study found useful included massage, acupuncture, yoga, meditation, relaxation, CBT, warmth (such as hot baths, saunas, warm clothes) and distracting activities. Important, interesting, fun and positively demanding activities were most effective at distracting one from pain. Using mental strategies to change the focus away from the pain was useful but took several years to learn. Although some found that physical exercise helped to get rid of the pain, some found that exercise made their pain worse. Participants felt that listening to their own body and respecting their own body's limitations was the most important tool, enabling them to find a balance between activity and rest (Löfgren & Norrbrink, 2012).

A qualitative study exploring fatigue after SCI comprised four focus groups of 21 men and women with SCI with two family members, two care-providing assistants and four occupational therapists providing additional information. Participants recommended that a fatigue management programme should include strategies to manage stress (such as yoga, breathing and relaxation techniques), relieve muscle tension and improve postural stability, improve sleep, conserve energy so that activities can be achieved with minimal effort, and maximise their residual potentials. They also emphasised the benefits of working in a group which enabled learning with and from other people with SCI (Hammell et al., 2009b).

The Feldenkrais® Method

The **Feldenkrais Method** was developed by Dr Moshe Feldenkrais, engineer, nuclear physicist and martial artist. He studied anatomy, physiology, psychology and human development, which led to his formulating theories about development and postural control (Stephens, 2000). Married to a pediatrician, Feldenkrais observed how infants learned to move. Using his scientific training, his personal experience and his observations of infant

movement development he learned to walk freely without surgery after an injury to his knee (Bearman & Shafarman, 1999). From World War II until his death in 1984, Feldenkrais taught classes which focused on developing people's ability to move more easily and comfortably (Stephens, 2000). The **Feldenkrais** approach to learning movement addresses many of the secondary issues highlighted in the SCI literature. In this section I will summarise the relevant **Feldenkrais** research for each of these issues.

A 2015 review of 20 RCTs investigating the **Feldenkrais Method** found that **Feldenkrais** may be effective in improving functions such as balance. However the authors recommended careful monitoring of individual impact as there was varied evidence at a group level and to date the studies have been of relatively poor quality (Hillier and Worley, 2015).

Table 1 on page 42 shows **Feldenkrais** studies investigating pain, fatigue, exertion, stress and anxiety, mobility, function and balance, all of which have been identified as secondary issues for people with SCI on page 17. A number of studies with **Feldenkrais** and people with chronic pain have provided evidence that the method may be effective in decreasing pain (Bearman & Shafarman, 1999; Connors, Pile, et al., 2011; Lundblad et al., 1999; Lundqvist et al., 2014; Sobie, 2013) and the extent to which pain interferes with daily living (Dean et al., 2008). There is also some evidence that the **Feldenkrais Method** has positively influenced the affective dimension of pain (Malmgren-Olsson, Armelius, & Armelius, 2001; Smith et al., 2001) and the extent to which people feel able to control their pain (Malmgren-Olsson & Bränholm, 2002). This evidence is backed up by qualitative studies. For example, a phenomenological approach was used to explore the experiences of 2 men and 9 women with chronic back pain (1 with SCI) who had completed at least one series of ATM lessons. Semi-structured interviews revealed that before attending **Feldenkrais** lessons, back pain was overwhelming, limiting and uncontrollable. After the **Feldenkrais**

lessons, back pain diminished rapidly. Self-awareness, comfort, movement repertoire, confidence, functioning and participation increased; they felt in control of their pain and their lives (Pugh & Williams, 2014). In another qualitative study examining the experiences and self-reported effects of 10 **Feldenkrais** ATM classes on 14 women with neck and shoulder pain, participants reported gaining greater control of their pain (Öhman et al., 2011).

There has been no research on the effect of **Feldenkrais** on spasticity. However, the method enables lengthening muscles without stretching (Stephens, Davidson, DeRosa, Kriz, & Saltzman, 2006) so it could potentially be effective in reducing spasticity.

There is some evidence that the **Feldenkrais** Method reduces fatigue (Dean et al., 2008) and increases vitality (Stephens, Pendergast, Roller, & Weiskittel, 2005). A number of other studies have provided preliminary evidence that **Feldenkrais** may be effective with anxiety and stress, contributors to fatigue (Johnson, Frederick, Kaufman, & Mountjoy, 1999; Kerr, Kotynia, & Kolt, 2002; Kolt & McConville, 2000; Netz & Lidor, 2003). These results are consistent with findings in a qualitative study conducted by Öhman et al. (2011) where participants observed that they were less tense "spontaneously I have discovered my tensed face, with my jaws pressed together and my staring eyes. (Being aware of this) helps me to relax more often" (Öhman et al., 2011, p. 158).

As mentioned on page 24, one of the contributors to fatigue is the effort required to accomplish routine tasks (Hammell et al., 2009a). The **Feldenkrais** Method reportedly increases efficiency of movement so that effort involved in performing everyday functions is reduced (Chinn, Trujilo, & Worrel, 1994; Ruth & Kegerreis, 1992; Stephens et al., 1999; Webb, Cofre Lizama, & Galea, 2013). A number of studies have provided evidence that the **Feldenkrais** Method leads to reduced effort in movement (Chinn et al., 1994; Ruth & Kegerreis, 1992; Stephens et al., 1999; Stephens et al., 2005; Webb et al., 2013).

Table 1. Feldenkrais studies

Year	Authors	Design	Participants	Intervention (FM)	Control (C)	Results
Random Controlled Trials (RCT)						
1992	Ruth & Kegerreis	RCT	30 people	**Feldenkrais** - 1 ATM class	Random activities	Neck flexion range of motion increased ($p<.01$) and perceived effort during flexion decreased ($p<.05$) significantly in **Feldenkrais** group
1994	Chinn et al.	RCT	23 people with upper back, neck, or shoulder discomfort	**Feldenkrais** - 22 minute ATM by audiotape	30 minutes of gentle neck and shoulder exercises	Perceived exertion was reduced in the **Feldenkrais** group ($p<.05$)
1999	Lundblad et al.	RCT	97 female industrial workers	1. **Feldenkrais** group - up to 4 FI and 12 ATM, 50 minutes per week, for 16 weeks plus homework practice 2. Physiotherapy group - 2 x 50 minutes per week for 16 weeks plus homework practice	No intervention	1. Complaints decreased significantly in **Feldenkrais** group compared to control group ($p<.05$) 2. No change in complaints in Physiotherapy group 3. worsening of complaints in control group
1999	Hall et al.	RCT	60 well women over the age of 65 randomly divided into three groups	1. **Feldenkrais** 2. Tai Chi	Control group	**Feldenkrais** had a significant impact on function including walking speed and activities of daily living and led to significant decreases in fear of falling and a quicker correction of balance problems

1999	Johnson et al.	RCT	20 people with multiple sclerosis	**Feldenkrais** - 8 lessons (45 minutes once a week)	Sham nontherapeutic body work for 8 weeks	Perceived stress was reduced in the **Feldenkrais** group (p=.01)
2000	Kolt & McConville	RCT	54 undergraduate physiotherapy students with no prior **Feldenkrais** experience	1. **Feldenkrais** group - 4 ATMs (45 minutes over 2 weeks) via audiotape 2. Relaxation group - 4 relaxation sessions (45 minutes over 2 weeks) via audiotape	No intervention	Females in the **Feldenkrais** and relaxation groups reported significantly lower anxiety scores at completion compared with the control group (p<.05). This reduction was maintained one day later
2001	Smith et al.	RCT	26 people with chronic low back pain	**Feldenkrais** -30 minutes via audiotape	Listening to a 30-minute narrative	The affective dimension of pain was reduced in the **Feldenkrais** group (p<.05)
2001	Stephens et al.	RCT	12 people with multiple sclerosis	**Feldenkrais** - 8 lessons (2-4 hours long) over 10 weeks	Educational sessions over 10 weeks	Balance and balance confidence (as measured by the Modified Clinical Test of Sensory Interaction in Balance (mCTSIB) and Activities Specific Balance Confidence Scale (ABC)) improved significantly (p<.05) in the **Feldenkrais** group
2006	Stephens, Davidson, DeRosa, Kriz, & Saltzman	RCT	33 graduate students	**Feldenkrais** - 5 ATM (15-minute sessions/week via audiotape) over 3 weeks	Regular daily activities	Hamstring muscle length **increased** significantly in the **Feldenkrais** group (p=.005)

2009	Vrantsidis et al.	RCT	55 people (mean age 75 years)	**Feldenkrais** (n=26) - 16 ATMs (40-60 minutes, twice a week)	Usual activity (n=29)	Significant improvements in mobility ($p<.05$) and the Modified Falls Efficacy Scale ($p<.01$) for the **Feldenkrais** group
2010	Ullmann et al.	RCT	47 community-dwelling adults (mean age 75.6 years)	**Feldenkrais** - 15 ATMs (1 hour 3x/week for 5 weeks)	Waitlist	**Feldenkrais** group showed significant improvements in balance ($p<.05$), mobility ($p<.05$) and decrease in fear of falling ($p<.042$)
2010	Hillier et al.	RCT	22 people aged between 60 and 88	**Feldenkrais** 8 ATMs (1 hour per week)	8 generic balance class 1 hour per week	Significant improvement in Single Leg Stance Time (SLS) for the **Feldenkrais** group only ($p<.05$). Significant improvements for both groups on the Functional Reach Test (FRT)
Other Controlled Trials						
2002	Malmgren-Olsson & Bränholm	Quasi-experimental controlled comparative outcome study	64 females, 14 males with non-specific musculoskeletal disorders	1. **Feldenkrais** (15 ATMs, 5 FIs, 2 audiotapes) 2. Body Awareness Therapy (BAT-17 group sessions, 3 individual sessions of 90 minutes over 3 months).	Physiotherapy, (5-90 treatments, median 20 treatments)	All groups showed significant improvements on health-related quality-of-life, self-efficacy and sense of coherence (which represents a mixture of optimism and sense of control).The improved self-efficacy stayed stable for the BAT and **Feldenkrais** group, whilst the physiotherapy group had deteriorated by one year follow up
2011	Connors, Galea, et al.,	Controlled trial	63 community dwelling older adults	**Feldenkrais** (n=26) - 20 ATM (1 hour, 2x/week)	No intervention (n=37)	**Feldenkrais** group showed significant improvements in mobility ($p=.017$) and significant

						improvements in the ABC (p= .005)
Pre/post Studies						
1999	Bearman & Shafarman	Preliminary pre/post	7 Medicaid recipients with chronic headaches and/or musculoskeletal problems	**Feldenkrais** programme divided into two phases (Phase 1: 4-5 hours/day, 4 days/week for 2 weeks. Phase 2:1-4 hours/week for 6 weeks).		Participants reported more mobility and decreased perceptions of pain, both immediately after the programme and in a one-year follow-up questionnaire. Patient costs dropped by 40%
1999	Stephens et al.	Pre/post	4 women with multiple sclerosis	**Feldenkrais** - 10 ATMs over 10 weeks		Subjective improvements in awareness of aspects of movement, flexibility, balance, control, ease of movement and mental outlook
2002	Kerr et al.	Pre/post	1. 23 volunteers 2. 55 volunteers	1. 1-hour **Feldenkrais** class each week for 10 weeks (n=23) 2. 1-hour **Feldenkrais** lesson during Week 5 (n=55).		Scores on the State Trait Anxiety Inventory (STAI) decreased significantly for both interventions (p<.005)
2003	Netz & Lidor	Pre/post	147 females	elected to attend a yoga, **Feldenkrais**, aerobic dance or swimming	Computer lessons	Improved mood following **Feldenkrais**, swimming, and yoga but not following aerobic dance and computer lessons
2005	Stephens et al.	Prospective, pre/post control group	31 well adults aged between 68 and 89	**Feldenkrais** - 10 ATMs (45 minutes over 2 days)(n=14)	Normal activities (n=17)	**Feldenkrais** group had significant improvements in vitality (p<.05), mental health scores (p=.01) and coordination (p=.05) with 93% reporting that supine to stand transfer was easier

2005	Schön-Ohlsson et al.	Pre/post	12 people with treatment-resistant chronic low back pain (CLBP)	**Feldenkrais** lessons for up to 12 months (1/week, an average of 30 lessons).		Before the intervention, a Posturo-Locomotion-Manual (PLM) was used to evaluate task performance and their scores were compared with 12 back-healthy people matched for sex and age. Pre-intervention, there were significant differences between the 2 groups (p = .005). Post-intervention and at 10 to 12 month follow-up, the **Feldenkrais** group had improved their performance so there were no longer any significant differences between the groups
2005	Batson & Deutsch,	Pre/post	4 people, 1 to 2.5 years post stroke	**Feldenkrais** - 15 ATMs (70 minutes per week over 6 weeks).		Mobility improved by an average of 55.2% (p=.033). Scores on the Stroke Impact Scale (SIS) improved by 35% Scores on the Berg Balance Scale (BBS) improved by an average of 11% (p=.034)
2005	Stephens et al.	Prospective, repeated measures control group	31 well adults aged between 68 and 89	**Feldenkrais** - ATM classes (n=14)	Control group (n=17)	
2006	Wennemer et al.	Pre/post	23 people with fibromyalgia	Multidisciplinary treatment programme which included **Feldenkrais** for 24 sessions (2 hours per session) over 8 weeks.		Significant improvements on physical functioning (p=.01), range of motion (p<.001-.01) and distance travelled during the 6-minute walking test (6MWT) (p<.01)

2008	Dean et al.	Pre/post	5 females with fibromyalgia (30-51 years of age)	**Feldenkrais** - 16 ATM (1 hour 2x/week), daily practice tapes. After 8 weeks, participants were placed on a 4 week home programme.		Significant reduction in the extent to which pain interfered with their daily activities ($p<.05$) Significant improvements in sleep/fatigue and the overall total of the Modified Fibromyalgia Impact Assessment (FIA) ($p<.05$)
2011	Connors, Pile, et al.	Pre/post-	48 **Feldenkrais** clients who were experiencing problems performing everyday functional tasks,	**Feldenkrais** 2-20 sessions (mean = 6.5)		Levels of pain decreased with an improvement in current pain ($p=.001$), bodily pain ($p<.001$), affective pain ($p = .001$), physical functioning index ($p <.001$-$.05$) and a 3.8 point improvement in the ability to perform everyday tasks as measured by the Patient Specific Functional Scale (PSFS)($p<.001$)
2013	Webb et al.	Pre/post	15 community dwelling adults with osteoarthritis	**Feldenkrais** - 60 ATMs (twice a week).		Participants improved on the Four Square Step Test (FSST) and some gait parameters and reported greater ease of movement
2016	Edgar et al.	Pre/post	27 retirement village residents	**Feldenkrais** - 12 ATM classes		Scores on the Patient Specific Functional Scale (PSFS) improved by 1.4/10 ($p<.001$)

Further studies have reported improved mobility (Batson & Deutsch, 2005; Bearman & Shafarman, 1999; Connors, Galea, & Said, 2011; Nambi, P., S., Patel, & D., 2014; Ramli, Leonard, & Harun, 2013; Ullmann et al.; Vrantsidis et al., 2009) which again reduces the effort involved in accomplishing everyday tasks. These results are consistent with findings in a qualitative study investigating the perceived benefits of 8 weeks of ATM (one per week) for older people. Participants reported improved movement "I feel like I've had a grease and oil change, you know what I mean? It feels as though my spine has been… A grease bottle has been squirted into every notch of it, and I feel looser and lighter and it's just…beneficial" (Broome, Shamrock, & Alcorn, 2015, p. 122).

Studies have also demonstrated improvements in functioning (Connors, Pile, et al., 2011; Edgar, Anderson, & Tuttle, 2016; Hall, Criddle, & Ring, 1999; Schön-Ohlsson, Willén, & Johnels, 2005; Wennemer et al., 2006) which again has an impact on the ability to perform everyday tasks. These results are consistent with the findings of a retrospective study where a questionnaire was mailed to a sample of 93 people who had been treated using **Feldenkrais** and/or yoga in a chronic pain management clinic. Thirty-four subjects returned the questionnaires, with results suggesting that two years post-treatment participants displayed increased function and maintained higher levels of function (Phipps, Lopez, Powell, Lundy-Ekman, & Maebori, 1997)

Many **Feldenkrais** lessons are based on the principles of postural control retraining which, according to Connors et al. (2010), is more effective in reducing falls than strength or endurance training. Research with the **Feldenkrais** Method has found evidence of improved stability in the case of the elderly (Connors, Galea, et al., 2011; Hall et al., 1999; Hillier et al., 2010; Ullmann et al., 2010; Vrantsidis et al., 2009), the able-bodied (Seegert and Shapiro (1999)

cited in Hillier & Worley, 2015; Hopper, Kolt, & McConville, 1999), and people with stroke (Batson & Deutsch, 2005), multiple sclerosis (Stephens et al., 1999; Stephens, DuShuttle, Hatcher, Shmunes, & Slaninka, 2001) and chronic pain (Dean et al., 2008; Sobie, 2013). Most of the balance studies have been conducted with the elderly although there have also studies been done with people with multiple sclerosis (Stephens et al., 2001) and stroke (Batson & Deutsch, 2005). Again these results are consistent with findings in a qualitative study with 14 women with neck and shoulder pain, conducted by Öhman et al. (2011). Participants noticed that their posture had improved. "My arms were relaxed and hung down. My whole spine was straight without effort. I felt as if my chest was broader, more room to breathe. My head and eyes horizontal, straight ahead. My legs and feet more steady and stable. I felt much taller" (Öhman et al., 2011, pp. 157-158).

The relevance of the Feldenkrais Method to SCI

The **Feldenkrais Method** appears to be an appropriate approach for working with people with SCI. **Feldenkrais** focuses on improving coordination (Connors et al., 2010) and being client-centred (Posadzki, Stöckl, & Mucha, 2010), learning-focused (Wildman, 1990), incorporating knowledge of biomechanics (Hannon, 2000; Hannon, 2000a, 2000b; Hannon, 2001a, 2001b) psychology (Feldenkrais & Kimmey, 1985) and intrinsic learning principles (Connors et al., 2010) and provides a learning tool for a diverse range of functions. The participant performs simple, achievable movements that are part of a whole function, without losing sight of the whole. They are supported in gaining awareness and understanding of movement properties relevant to this function. As they perform the movements, the practitioner asks the participant simple questions to help them recognise internal bodily responses which provide intrinsic feedback on their performance (Rywerant, 2000).

Feldenkrais includes a form of MI described by Connors et al. (2010) as mental practice or imagery. However, the way in which MI is practised in **Feldenkrais** (which is described in **Feldenkrais** case studies with SCI (Bost, 1997; Ginsburg, 1980)) is somewhat different to the process described by Cramer et al. (2007) on page 32. They describe the use of MI training on a paralysed body area, i.e., the foot. Ginsburg (1980) points out that when we carry out an intended action, the whole nervous and musculoskeletal system is activated. However there is a tendency for people to describe only the obvious moving part of the action. In a **Feldenkrais** lesson, clients are encouraged to pay attention to the proprioceptive sense in other parts of the body (e.g., the hip, the spine, the head). In this way, they can observe and let go of muscular tension and co-contractions in other parts of the body (e.g., the abdominal muscles) that may be interfering with the execution of an action.

Whereas some of the participants in the study conducted by Cramer et al. (2007) became fatigued, fatigue is reportedly reduced in the **Feldenkrais Method**. In the **Feldenkrais** context, fatigue can be an indicator that the client has tried too hard (even in their imagination). One of the principles used in the **Feldenkrais Method** is the Weber-Fechner principal which states that the threshold for sensing difference in stimulus is a certain fraction of the overall stimulus. In order to distinguish small differences, the overall stimulus needs to be reduced (Rywerant, 2000). In a **Feldenkrais** lesson, clients are encouraged to perform or imagine performing with minimal effort. The more effort we put into a movement, the more difficult it is to make the sensory discriminations that facilitate learning and the more fatigued the client becomes.

Increasing body awareness is an important component of the **Feldenkrais Method** (Connors et al., 2010). As one of the participants in the qualitative study conducted by Pugh and Williams (2014) stated “you suddenly become aware that you’ve got a whole body and you’ve

got all these points join together and if you move one point it's going to impact on the whole" (page 177). You are "slowly awakening parts of your body that don't often move that actually help the overall process of movement" (page 178).

There is evidence that **Feldenkrais** can lead to changed activation of the motor cortex. In a study assessing recovery after stroke, brain activation of a patient who had suffered left middle cerebral artery stroke nine months previously was studied using functional Magnetic Resonance Imaging (fMRI). Brain activation was studied on three occasions, approximately 1 month apart. Between scans the patient was given lessons based upon the **Feldenkrais** method. During this time alterations in recruitment of the affected primary motor cortex was observed (Nair, Fuchs, Burkart, Steinberg, & Kelso, 2005).

It appears that improvements in awareness may be related to improvements in function. In a **Feldenkrais** pre/post study (Dunn & Rogers, 2000) investigated the effect of sensory imagery on movement. In their study 12 people undertook 30 minutes of guided imagery on the left-hand side of the body (imagining a soft brush passing over the left side of their body). Changes in forward flexion were assessed using a sit and reach test. Eight of the participants reported that, following the imagery exercise, the left side of the body felt longer. For these participants the distance reached on the left side increased significantly ($p < .004$) (Dunn & Rogers, 2000).

Like task-specific training (Boswell-Ruys, Harvey, Barker, et al., 2010), the **Feldenkrais Method** focuses on improving function. However **Feldenkrais** lessons are broken up into smaller chunks where an aspect of a function is explored. For example, an important part of picking up an object to the right of oneself is being able to bend to the right or laterally flex. Boswell-Ruys et al.(2010) suggest that learning subtle strategies to move parts of themselves

(such as the head or arms) over the base of support during the performance of tasks may be an important part of improving stability. Discovering different strategies (including the strategies proposed by Boswell-Ruys, Harvey, Barker, et al. (2010)) is an explicit part of a **Feldenkrais** lesson. Rather than focusing on the goal of picking up the object, the client pays attention to the process of the movement. They are encouraged to notice how they perform the movement and are given the tools to explore such strategies. The ability to laterally flex can be applied to other tasks and the strategies that one learns in a lateral flexion lesson can be generalised to other lessons. As Feldenkrais wrote in his book *Awareness Through Movement*:

> The execution of an action by no means proves that we know, even superficially, what we are doing or how we are doing it. If we attempt to carry out an action with awareness - that is, to follow it in detail - we soon discover that even the simplest and most common of actions, such as getting up from a chair, is a mystery, and that we have no idea at all of how it is done (Feldenkrais, 1990, p. 46).

Whereas task-specific training (see page 31) requires intensive input from the therapist and is thus not feasible in most rehabilitation facilities (Harvey et al., 2011), the **Feldenkrais** approach focuses on learning how to learn. As described by Connors et al. (2010), rather than teaching specific strategies, the method uses exploratory learning which results in learning which can be generalised from one situation to another. One **Feldenkrais** strategy, for example, is the focus on intrinsic feedback as opposed to extrinsic feedback as extrinsic feedback is considered to distract the participant from discovering how to do the movement themselves. Instructors do not generally demonstrate a movement or correct a participant; rather they provide suggestions on ways to practise a movement without classifying movements as right or wrong. Thus the

practitioner's role is to help clients discover for themselves how they can improve their own movement and stability. Once the client understands some movement principles, they are free to explore and expand their skills in their own time. A retrospective study looking at the effects of **Feldenkrais** and yoga on 93 people who had attended a chronic pain management clinic found that they were still using the skills they had learned two years later (Phipps et al., 1997).

It is likely that people with SCI will appreciate the **Feldenkrais** approach to learning. It includes features that many people with SCI have been requesting. For example, **Feldenkrais** includes strategies for dealing with fatigue and fatigue related issues that were recommended by Hammell et al.(2009b). These include strategies to manage stress (Johnson et al., 1999; Kerr et al., 2002; Kolt & McConville, 2000; Malmgren-Olsson & Bränholm, 2002), to relieve muscle tension and improve postural stability (Batson & Deutsch, 2005; Buchanan & Vardaxis, 2000; Connors, Galea, et al., 2011; Connors et al., 2010; Hall et al., 1999; Lake, 1992; Stephens et al., 2001; Ullmann et al., 2010; Vrantsidis et al., 2009), to improve sleep (Dean et al., 2008), to improve ease and efficiency of movement (Batson & Deutsch, 2005; Connors, Galea, et al., 2011; Dunn & Rogers, 2000; Ruth & Kegerreis, 1992; Schön-Ohlsson et al., 2005; Stephens et al., 1999; Stephens et al., 2005; Ullmann et al., 2010), and to maximise physical functioning (Bearman & Shafarman, 1999; Connors, Pile, et al., 2011; Phipps et al., 1997). It can also be presented in a group format (ATM) enabling learning with and from other people with SCI.

Feldenkrais clients frequently find the **Feldenkrais** approach enjoyable. A study investigating the acceptability of a **Feldenkrais** balance programme for participants over 55 years of age found that the classes were viewed positively by the participants. With 26 participants in the intervention group, there was high-class attendance (88%) and positive feedback from satisfaction surveys with 91% of the participants saying they enjoyed the

programme "very much" (Vrantsidis et al., 2009). A retrospective study looking at the effects of Feldenkrais and Tai Chi classes on balance in 60 elderly participants found that the classes were popular with participants and retention rates were high (Hall et al., 1999).

Although there appears to be no documented record of case studies with people with SCI doing ATM, the broader literature contains case studies of FI lessons where individuals with SCI have found **Feldenkrais** to be helpful in the management of pain and spasticity (Bost, 1997; Ginsburg, 1980, 1986) improve mobility (Bost, 1997; Fox, 1978; Ginsburg, 1980, 1986) and postural stability (Bost, 1997; Ginsburg, 1980; Wong, 2007). There is documented evidence of Moshe Feldenkrais giving FI lessons to people with SCI. Feldenkrais describes a lesson where he increased muscle tone in the foot of a man who had been paralysed from the neck down for 32 years (Fox, 1978). Ginsburg (1980) reported observing Feldenkrais working with a woman with paralysis in 1977. At the beginning of the lesson, the woman did not know where her body was below the injury. During the lesson, Feldenkrais helped her to restore her body image and at the end of the lesson she was able to move her leg (Ginsburg, 1980).

A 1980 video recording (held in the International Feldenkrais Federation (IFF) North American Video library) shows Feldenkrais completing 11 FI lessons over 6 weeks with Ronald. Ronald had sustained an SCI after a fracture at T4 16 years before. A particular issue for Ronald was spasticity of the legs. During the lessons, Ronald learnt to improve his ability to rotate, to look left and right, to organise his legs more effectively when rolling, to use his pelvis in flexing and extending, to engage his stomach muscles, to begin to abduct and adduct his right leg, to stabilise his legs when prone and to improve the connection between his neck and spine. The spasticity in his legs decreased and his body awareness improved. Other benefits included improvements in his ability to do wheelchair transfers, to come to stand with the standing frame,

and to stabilise himself in sitting which meant that he was more able to put his shoes on and off without overbalancing (International Feldenkrais Federation, 1980).

Bost (1997) documented a case study that took place over five years beginning in August 1991 with a pause in 1995/96. During this time she gave FI lessons to Michael, with T12/L1 incomplete paraplegia, almost 2½ years after his accident. To begin with he could walk with two braces and two crutches but he couldn't sense where his legs were. In the second session, he felt more connected to his lower spine and pelvis. In the sixth session, he could feel where his right leg was. From when they started working together, Michael repeatedly noticed "a sudden leap in muscular coordination". At the end of the case study, Michael was walking without crutches. He reported walking back and forth across black ice with a bucket of hot water to remove ice from his windscreen, without feeling unsafe (Bost, 1997).

A Nottwil (Swiss Paraplegic Centre) case study describes the experience of Lisa, a keen sportswoman, who had an injury at T8 (ASIA A). A significant issue for her was feelings of instability ("fear of falling"). She found that she continually toppled over when sitting and sometimes exhausted herself performing tasks such as dressing and doing wheelchair transfers. It also limited her ability to participate in physical activity. Interventions included counselling, swimming, fitness training, circuit training, hippotherapy, body balance training, repetitive training of transfers, wheelchair training, sports activities, drugs and **Feldenkrais**. Of all the interventions, she felt **Feldenkrais** to be the most helpful with her instability, which she felt had almost gone (Wong, 2007).

Ginsburg (1980) published two case studies using FI combined with other modalities. The first documented two case studies with long-term paraplegia. The first was with a woman with a complete T11/12 injury, 10 years after her injury. By combining **Feldenkrais** FI Lessons,

Biofeedback and Rolfing (an alternative treatment involving soft tissue manipulation and movement education) she had a decrease in painful spasticity and a return of sensation and movement in her legs and she learned to stand. The second was with a woman with a T10 injury, also 10 years after her injury. With a combination of **Feldenkrais** FI lessons and Acupuncture (a key component of traditional Chinese medicine) she regained sensation, stability and movement in her legs (Ginsburg, 1980).

The Shake-A-Leg programme in Rhode Island, founded in 1982, was a holistic rehabilitation programme designed mainly for people with SCI and related conditions. The programme was initiated by Harry Horgan, a young man with a T5/T6 injury and offered a range of approaches that he found helpful including **Feldenkrais**. Ginsburg (1986) documented some of the changes that took place for participants. For example, Providencia recovered leg movements after 16 years in a wheelchair. Jack, who came to the programme with strong spasms in his legs and limited use of his hands, recovered near-normal use of his right hand and significantly reduced his spasms (Ginsburg, 1986).

In the Next Chapter

In this chapter I have outlined the literature related to the **Feldenkrais Method** and SCI. In the next chapter I will introduce the methodology I used for my study.

Chapter 3. Methods

In the previous chapter I provided a background to SCI secondary issues and research the potential for the **Feldenkrais Method** to ameliorate these issues. In this chapter I will describe the approach I used to develop and evaluate a **Feldenkrais** programme for people with SCI.

For this study I used an action research process (Dick, 1993; Herr & Anderson, 2005; Robson, 2002). Action research is a method which aims to bring about change in an organisation, community or programme (action) and to increase understanding on the part of the client, researcher or both (research). Practitioners in the field can use action research as part of their normal activities (Dick, 1993).

Action research differs from descriptive social science research in that it requires intervention (Herr & Anderson, 2005). Some forms of action research emphasise action with "research" taking the form of increased understanding on the part of participants and others directly involved. In other forms, the emphasis is on research with action being a by-product (Dick, 1993). For my study I have chosen to give emphasis to both research and action.

Action research takes place as a series of action cycles. Each cycle involves developing a plan of action, acting to implement the plan, observing the effects of the action, and reflecting on these effects as a basis for further action. Thus it allows the researcher to reflect on the process of the research as well as the findings (Herr & Anderson, 2005).

Action research is frequently participative as participation can generate greater commitment and hence action (Dick, 1993). For this reason, in action research, enquiry is done by or with insiders to a community or organisation. The position of the researcher can range from being an insider (where one studies one's own self or practice) to an outsider (studying a community from an outsider's perspective) (Herr & Anderson, 2005). Although collaboration

between researchers and participants is typically seen as central to action research, initial thoughts about the topic may have been developed in consultation with others such as professional colleagues or user groups (Robson, 2002).

An action research thesis can look very different from a conventional thesis (Dick, 1993). It is often written up in a narrative style (Herr & Anderson, 2005) and there appears to be no definitive guidelines on how it is to be structured. Action research also differs from many forms of conventional research in the way that the research questions are defined. Whereas in some forms of research you can start with a very precise research question, in action research your initial research question can be imprecise. This imprecision is mainly due to the nature of social systems; you're not working in a controlled experimental condition and, in order to achieve your action outcomes, you need to be responsive to the participant's needs which are partly unknown at the outset. However, throughout the process of the study, you can refine your questions and methods and, provided each cycle adds to clarity, you will eventually converge towards precision. The spiral process enables both responsiveness and rigour (Dick, 1993).

Some may consider action research to be less rigorous than other forms of research which gain rigour by control, standardisation, objectivity and the use of statistical procedures (Dick, 1993). In contrast, action research frequently uses qualitative methods as qualitative research allows one to be more responsive to the situation (Dick, 1993).

Another criticism of action research is its lack of generalisability. According to Dick (1993) there is a trade-off between local relevance and global relevance. In order to respond fully to the local situation, global relevance can be sacrificed. Whereas this lack of generalisability can be expected in some qualitative research, Herr and Anderson (2005) suggest that action research should not be judged by the same criteria as naturalist research. Whereas many qualitative

researchers take the position of being “a fly on the wall”, action researchers act to make changes to the setting.

Validity Criteria

Herr and Anderson (2005) identify five goals of action research to which they link five validity criteria. These validity criteria are tentative and some criteria are appropriate for some circumstances and inappropriate for others. The five goals of action research that they identify are the generation of new knowledge, the achievement of action-oriented outcomes, the education of both researcher and participants, results that are relevant to the local setting and a sound and appropriate research methodology.

The generation of new knowledge requires both ‘dialogic’ and ‘process’ validity (Herr & Anderson, 2005). To achieve dialogic validity, the research must be reviewed by peers. This can be achieved by participating in dialogue with other action researchers or a “critical friend”. The critical friend is independent of the thesis committee and is someone with whom the researcher can work through some of the issues faced in the setting (Herr & Anderson, 2005). Critical friends provide understandings that might otherwise be elusive without the perspective of another person. They can bring clarity to grey areas and a necessary muddiness to something that may have seemed prematurely clear. Critical friends can be either insiders or outsiders to the research project (Stieha, 2014).

Process validity asks to what extent problems are framed and solved in a way that allows ongoing learning. The process of reflection should include re-examining underlying assumptions and some form of evidence must be used to support assertions. An action researcher needs to

defend the specifics of decisions made throughout the study (Herr & Anderson, 2005). A sound and appropriate research methodology requires process validity (Herr & Anderson, 2005).

The achievement of action oriented outcomes requires 'outcome' validity. This asks to what extent the actions that take place lead to resolution of the problem that led to the study or force the researcher to reframe the problem in a more complex way, leading to new questions or problems (Herr & Anderson, 2005).

The education of both researcher and participants requires 'catalytic' validity which asks to what extent the research process leads to both researchers and participants deepening their understanding of the reality under study. Keeping research journals enables researchers to monitor changes in both themselves and the setting (Herr & Anderson, 2005).

Results that are relevant to the local setting require "democratic" validity. Action research is concerned with "making it meaningful" and democratic validity asks questions such as to what extent is the research done in collaboration with stakeholders, have multiple perspectives been taken into account, and are the constructs and products of the research relevant to the participants (Herr & Anderson, 2005).

Meeting Validity Criteria

I met dialogic validity by consulting with an action researcher and a number of critical friends. In some cases, the critical friends were potential stakeholders. For example, I consulted with **Feldenkrais** practitioners (including my advisors, Dr Larry Goldfarb and Dr Jim Stephens). Dr Goldfarb has a PhD in Human Movement Science and is a Certified Trainer of the **Feldenkrais Method®** and a member of the **Feldenkrais Guild of North America®**. Besides directing and teaching in professional training programmes in Europe, Australia, and North

America, he teaches public workshops, professional seminars, and post-graduate courses all over the world. Dr Goldfarb is committed to developing explicit frameworks for understanding the method and for making the method relevant in everyday life. Besides training new teachers, he conducts post-graduate training programmes for **Feldenkrais** teachers and maintains a private practice in Santa Cruz, CA. Dr Goldfarb's role was to guide me in the design and development of the programme. Dr Stephens is a physiotherapist, a Certified Practitioner of the **Feldenkrais Method®** and a member of the **Feldenkrais Guild of North America®**. He has undertaken a number of research projects on the **Feldenkrais Method** including research with multiple sclerosis and the elderly. Dr Stephen's role was to provide guidance on outcome measures and the practicalities of research into the **Feldenkrais Method**. As my advisers live in America, communication was via e-mail, telephone and Skype. I also consulted with both national and international people with SCI (two of whom were **Feldenkrais** practitioners), all of whom could potentially have a stake in the success of this project.

Other critical friends had little or no stake in the project. For example, I consulted with a retired physiotherapist with an interest in human movement and a particular passion for client-centredness. I also consulted with a group of Health Sciences staff and postgraduate students who attended some of the earlier versions of the ATM classes that I developed for my programme. I sought advice from a Māori Health Mentor to ensure that the programme was culturally appropriate for Māori and compatible with the Māori Health Model. This was in line with the New Zealand Disability Strategy 2001 Action 11.3: "Ensure mainstream providers of disability services are accessible to and culturally appropriate for disabled Māori and their whanau" (Dalziel, 2001, p. 25).

I achieved process validity by framing the questions in a way that enabled me to learn from the process. Throughout the study I made decisions based on by observations and feedback from participants and explained the rationale for my decisions, for example on page 72. I achieved outcome validity in that I developed a programme as I had intended that seemed to address in part some of the problems presented by SCI. I also identified some of the issues that would need to be addressed in future research. I achieved catalytic validity in that my participants and I deepened our understanding through this process. This is evident through my reflections throughout the study and also the feedback from the participant interviews in Chapter 7. I have achieved democratic validity as in this study, I was an insider working in collaboration with other insiders. The other insiders were the key stakeholders for this project, i.e., the participants with SCI. The feedback from the participants (for example see page 132) suggests that the programme was relevant to them.

My Perspective

As this is an action research study and relies mostly on my observations and interpretations, it is important to be aware of the biases I bring to this research. In this study, I was working as a practitioner researcher and the project was shaped by my personal background, experience and philosophical position. I have worked in a range of fields including **Feldenkrais**, equal employment opportunities, human resources, information technology, training and facilitation, and mental health research. I completed my **Feldenkrais** Professional Training in 2003. Since then I have run ATM classes both privately and for the Christchurch City Council Pioneer Leisure Centre and have worked privately doing FI with people with SCI.

I came to the **Feldenkrais Method** in the late 1990s as a result of pain and loss of movement and sensation which affected my independence. I tried many approaches to my recovery; most were either ineffective or made me worse. One of the more detrimental approaches was a stretching and strengthening programme overseen by a physiotherapist. It was intended to improve my strength and flexibility but led to significant increases in pain and deterioration in my functioning. An introduction to the **Feldenkrais** method was a turning point for me. It lead to significant decreases in pain and improvements in balance, mobility and sensation. I found the method to be not only an effective but also a cheaper alternative to many other interventions available. As the method focuses on learning about movement and no special tools are required, I could practise at home once I understood some basic principles. This meant I didn't have to pay for regular treatments or spend time or money travelling to appointments.

I consider myself a pragmatist and believe that quantitative and qualitative research is compatible. In my practice, I strongly believe in using a client-centred approach. Key features of client-centred practice include a respect for the client's values, preferences and needs; and a supportive and caring relationship between the client and practitioner that prioritises empowerment and power-sharing (Bright, Boland, Rutherford, Kayes, & McPherson, 2012). I believe that, in client-centred practice, there are opportunities for learning for both the client and the practitioner. Whereas the client has the chance to learn from the practitioner's specialised knowledge of generalised theory (in this case motor learning principles), the practitioner has the chance to develop a deeper understanding and to refine his/her theory on the basis of the client's experience. The practitioner is not an expert on the client. Recognition that each client is unique and an expert on their own experience is fundamental. The client's perspective is of critical importance in the selection, development and evaluation of any initiative that affects the client.

Why I Chose Action Research

I believe that action research is compatible with a pragmatic philosophy. In addition I was working as a practitioner researcher and action research is easier to integrate into practice than other methods. Action research is well-suited to practitioner research as it involves both action (improvement of practice) and research (creating knowledge about practice). This knowledge can include both local knowledge (that is mainly relevant to the setting under study) and transferable knowledge (that can be used in other settings) (Herr & Anderson, 2005). I wanted to improve my skills as a **Feldenkrais** practitioner and at the same time generate knowledge that could be of value to other stakeholders (such as **Feldenkrais** practitioners, physiotherapists and people with SCI) and to myself and the development of future programmes.

My project involved both development and evaluation. Unlike some evaluation studies where the evaluation is done on a previously developed programme, my project required me to evaluate as well as develop. The cyclical and responsive nature of action research made it possible for me to continually refine my programme.

I also valued the participative nature of action research which is consistent with my belief in a client-centred approach. The issues that people with SCI face are complex. Performing research that incorporates partnerships with people with SCI increases the likelihood that these complex issues are addressed (Hammell, 2010). In developing my programme, I wanted to ensure that the perspectives of the participants and other stakeholders were taken into account.

The Social Model of Disability

In this study I was guided by the Social Model of Disability. The Social Model of Disability arose out of the reaction against social barriers that lead to exclusion of disabled people from mainstream activities. It involved "a switch away from focusing on the physical limitations of particular individuals to the way the physical and social environment impose limitations upon certain categories of people" (Oliver, 1981, p. 28). The social model distinguishes between the biological (impairment), such as the physiological consequences of an SCI, and the social (disability). Disability is attributable to a social organisation which takes minimal account of people with impairments and so excludes them from participation in mainstream activity (Barnes, 2012). While individual variations may cause individual impairments, these do not necessarily lead to disability if society takes into account people's individual differences.

The social model does not deny the importance of appropriate individual interventions but draws attention away from the functional limitations of individuals onto disability caused by disabling environments, barriers and culture. Whereas impairment may be a human constant, disability need not be so. How people manage their impairment can be determined by their access to social and material resources (Barnes, 2012). Rather than having disabilities (as implied by the term "people with disabilities"), people are disabled as implied by the term "disabled people". Throughout this thesis I will use the term "disabled people" which is the term used in the literature on the social model (e.g., Barnes, 2012) and the New Zealand Disability Strategy 2001 (Dalziel, 2001).

The Cycles

This study involved three main cycles or phases.

1. Phase One involved the development of a draft programme. Within Phase One, there were three cycles: choosing the ATMs with input from three people with SCI, designing the programme and testing the programme on **Feldenkrais** practitioners.
2. Phase Two involved evaluation of the programme delivery with a group of five people with SCI. Qualitative data were collected from participants and changes were made to the programme in response to participant feedback and practitioner-researcher reflections.
3. Phase Three involved a pilot evaluation of the impact of the programme on five people with SCI. The whole process is illustrated in Figure 1.

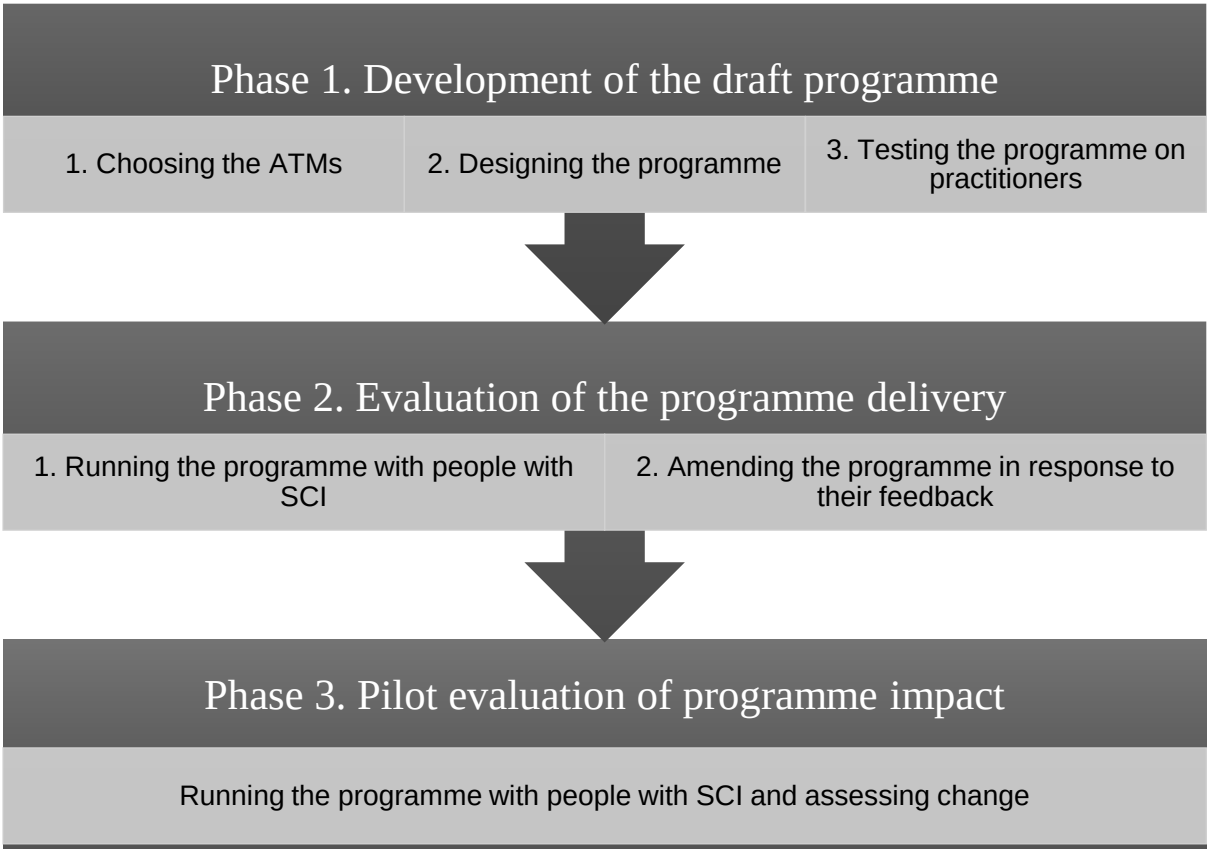


Figure 1. PhD phases

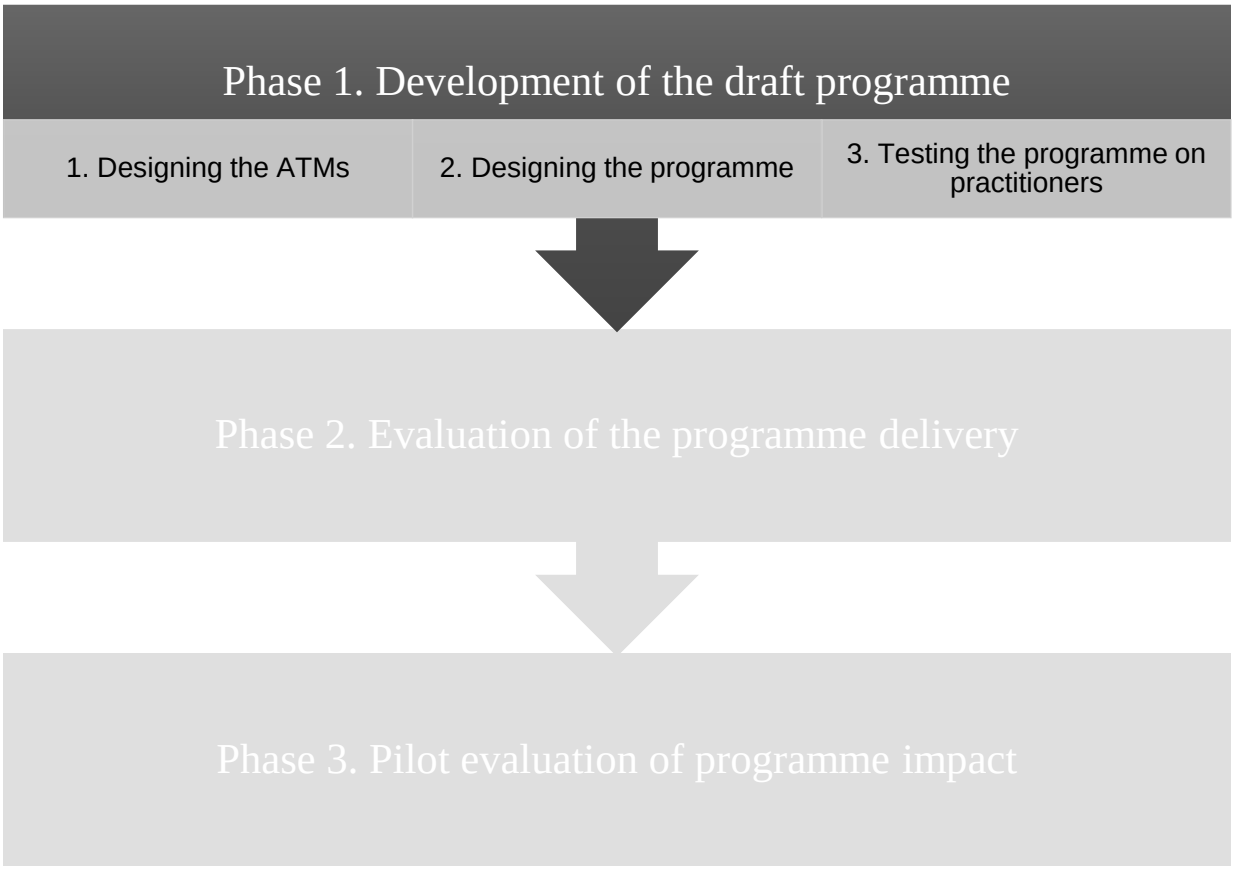
Methods

The first two phases of my study were qualitative and the third and final phase was mixed methods incorporating both a qualitative and a quantitative method (single case research studies). Single case research studies seemed appropriate for an action research project as they enable modification of an intervention and responsiveness to individual situations without having to instigate a whole new study. See Chapter 6 for more detail. Using qualitative methods enabled me to explore variables that are usually not present in quantitative studies.

In the Next Chapter

In this chapter I have described action research, the process I used in my study. In the next chapter I will describe the first phase of my study – development of the draft programme.

Chapter 4. Phase 1: Development of the Draft Programme



In the previous chapter I introduced action research and briefly introduced the phases involved in my project. In this chapter I will describe the first phase of my study in which I developed my draft programme.

Purpose

The purpose of this phase was to develop a draft **Feldenkrais** programme for people with SCI. This is in line with The New Zealand Disability Strategy Action 9.4 which aims to "support the development of arts, recreational and sports projects, including those run by and for disabled people" (Dalziel, 2001, p. 23).

Research Questions

1. Who were my target audience?
2. What were the characteristics of the target population?
3. What was an appropriate topic?
4. What were the goals of my programme?
5. What was an appropriate timeframe?
6. What was suitable content for the programme?
7. What strategies would I need to teach my target audience?
8. What resources would I need?

Procedure

In this phase, I developed a draft **Feldenkrais** programme in consultation with colleagues with SCI, advisers and other **Feldenkrais** practitioners, a Māori Health Mentor and critical friends. I was also informed by my ongoing work with SCI clients, the literature on SCI (including case studies and autobiographies) and my personal experience as a client of the **Feldenkrais Method**. This phase involved three cycles.

Cycle 1: Designing the ATMs.

The first cycle of this phase involved determining what ATMs to use, considering how ATMs could be modified to meet the needs of my target audience and determining what resources I would need. In order to do this I needed to make decisions on who my target audience would be and what were the characteristics of that population.

I reflected on the needs of my clients and my earliest experiences of the method. I reviewed my notes from my lessons with clients with SCI, case studies written by other **Feldenkrais** practitioners (e.g., Helga Bost (Bost, 1997)), documentaries (e.g., "Moment by Moment: the Healing Journey of Molly Hale" (Fadiman, 1995)), autobiographies by people with SCI (e.g., "Walk with Me", (Hitchcock, 1998), "Waking: A Memoir Of Trauma And Transcendence" (Sanford, 2006), "Still Me" (Reeve, 1998)), and theses by people with SCI ("Paraplegic Bodies: self and society" (M. J. Sullivan, 1996), "Rehabilitation of walking and psychosocial well-being in people with severe spinal cord injury" (Isakovic-Cocker, 2006) and "Walking on One's Own Two Feet: Paraplegia, a Somatic Investigation" (Lober, 1987)). I contacted overseas people with SCI who had reported using **Feldenkrais** and practitioners who had worked with people with SCI and asked them whether:

- there were any particular lessons or movements that had been particularly helpful
- there was anything in particular in the practitioner's approach that worked well
- there were any particular positions or actions that tend to trigger spasm
- they had found any useful strategies for dealing with spasticity.

I also contacted **Feldenkrais** researchers such as Glenna Batson, who had conducted a research project investigating the effect of ATM following stroke (Batson & Deutsch, 2005), and Dr Stephens, who had conducted research with the elderly and people with multiple sclerosis (Stephens et al., 1999; Stephens et al., 2001; Stephens et al., 2005).

Taking my budget and physical capacity into consideration, I decided that my target group should be people that could get on and off the floor. This would mean I would not require special equipment to enable them to do lessons that involved lying on the floor. I reviewed ATM lessons that I had taught to the able-bodied public and identified which (with modification)

would be suitable for this group. I modified these lessons and trialled them with a group of three people with SCI who worked on the Burwood hospital premises (Group 1). They had had their injuries between 15 and 30 years and two members of this group had been clients previously. I further modified the lessons in response to their feedback and considered what resources and equipment could help meet their needs. Partway through this process (in September 2011) we had a major earthquake. Initially I was reluctant to get the participants back onto the floor in case another earthquake hit and they needed to evacuate the room quickly so I suspended the process. When we eventually resumed the lessons in February 2012, another major earthquake hit. As a result, the room I had been teaching in was out of action, there were now limited rooms available at the hospital, one of the people I had been teaching left his job, another left Christchurch and travelling across town had become difficult because of damage to the roads.

As a compromise, I began teaching the ATM lessons to a small group of University of Canterbury staff and postgraduate students (Group 2), modifying them according to their feedback. At this time, I consulted with a Māori Health Adviser to ensure that the lessons would be culturally appropriate for Māori and compatible with the Māori Health Model. She attended three of the lessons. Dr Goldfarb reviewed four of the lessons and advised me on how to improve structure and content.

Cycle 2: Designing the programme.

Cycle Two involved organising the ATMs into a programme with a cohesive theme and preparing the non-ATM content of the programme. In order to decide on a suitable frequency and duration for the lessons, I reviewed other research studies on **Feldenkrais** and on SCI. In order to identify which were the most useful **Feldenkrais** principles to teach and how best to represent them I reviewed my notes from my **Feldenkrais** Professional training and "Anatomy of a

Workshop", (Goldfarb, 2006) a workshop presented by Dr Goldfarb and I discussed my plans for the content with Dr Goldfarb.

Cycle 3: Testing the programme on Feldenkrais practitioners.

Cycle Three involved testing the programme on other **Feldenkrais** practitioners. I taught the programme to John Mander, a **Feldenkrais** practitioner and physiotherapist, who had had some experience of working with people with SCI. I modified the programme according to his feedback, and then taught the resulting programme to a group of Christchurch **Feldenkrais** practitioners (Group 3) one of whom had had experience as a nurse in the Burwood Spinal Unit. I modified the programme in response to their feedback.

The Findings

The feedback and observations from the three cycles enabled me to answer my research questions and in doing so make decisions on how to develop my draft programme. In this section I will outline the findings that led me to making these decisions.

1. Who were my target audience?

As the programme incorporated movement and the range of physical abilities within the SCI population is broad, it was not appropriate to develop a single programme for people with SCI. I have met people with SCI with varying degrees of physical ability - larger than the variance I see in the able-bodied population. Even two people with the same diagnosis can have very different degrees of functioning. Some people have almost full functioning; others have been paralysed from the neck down and on ventilators. Whereas it would be ideal to eventually have a range of **Feldenkrais** programmes for differing levels of ability, I needed to narrow my focus. I chose therefore to target people with SCI who could get on and off the floor. For Glenna

Batson's study on the effect of ATM on people with stroke, people that could not get on and off the floor worked on low tables. Whereas incorporating tables in my study would have broadened my target audience, it would have required my having a permanent space and more funding than I could expect to have for a PhD. By limiting my participants to people that could get on and off the floor it also ensured that there was some similarity between the functional capacities of all participants; thus lessons could be designed that were appropriate for this group. My participants in Group 1 fitted these criteria.

Given Group 1 required a lot of the assistance from a qualified **Feldenkrais** practitioner, I decided to limit the group for the next phase of my study to no more than five people; I did not think I would be able attend to more than five.

2. What were the characteristics of the target population?

There were a number of characteristics of SCI that I needed to take into account when developing the programme. These included: distortions of proprioception, pain, spasticity, contractures and other sensations, susceptibility to injury, poor stability and mobility, sensitivity to pressure and cold, a history of challenge and diversity.

Distortions in proprioception.

Distortions in proprioception are usually present, a common distortion being the sense of being pulled into flexion. In autobiographies by people with SCI (e.g., "Walk with Me" (Hitchcock, 1998)) they describe feeling as if they are in the flexed position, particularly immediately after the injury or in times of stress. This flexed position is consistent with what Moshe Feldenkrais describes as the "body pattern of anxiety" a reflex that we have developed to protect our vulnerable areas when we are falling or threatened in any way. When we are unable to actively resist the threat, we revert to passive self-protection by activating the flexors and

inhibiting the extensors (Rywerant, 2003). Features of this pattern include: head forward and tucked in so the chin covers the throat, contracted abdominal muscles to protect the organs, tightened pelvic floor, adductors internally rotated and tightened (leading to bent knees and legs rolling inwards), increased muscle tone in chest, neck and face, shallow breathing, elevated pulse and blood pressure, and chemical and circulation changes. Feeling as if they were in the flexed position was also described by some of my clients. For example, after his injury one of my clients tended to feel as if his legs were folded over his chest even though they were straight. Another client described feeling as if he was flexed when the physiotherapists tried to stretch him out even though he was lying flat.

Pain, spasticity, contractures and other sensations.

Pain, spasticity and muscle contractures (where muscles are tightened causing work of some muscle groups, for example, the adductors) are also common consequences of SCI (Bloemen-Vrencken et al., 2005). Clients have also reported sensations such as tingling, burning, numbness, weakness or loss of sensation. These are frequently unpleasant and could potentially interfere with concentration in ATM lessons. I have noticed with my clients that the contractures often pull them into a flexed position. People frequently try to relieve the contractures by stretching or splinting. While some have found these strategies useful, others have reported negative consequences such as an increase in contractures, a loss of proprioception, pain and autonomic dysreflexia. For example, one of my clients was left overnight in a splint designed to decrease contractures in the elbow; the contractures actually increased.

Although spasticity interferes with movement, it can also be used to initiate movement. However it may not be the most efficient way of moving. When I first started working with people with SCI, I noticed that a common strategy for initiating movement was using spasm.

Prior to performing various movements such as rolling over, clients tended to extend the shoulder or flick back the arm. They told me that this was a strategy that they had been taught to trigger a spasm. The purpose of the spasm was to provide momentum for the movement. However, as one of my clients commented, when you use spasm to initiate a movement it becomes difficult to sustain the movement. I have found that this preparatory movement can become unnecessary once people learn to organise their movement more efficiently.

Getting some of these symptoms under control takes time and some symptoms can be triggered by particular movements. For example, people with SCI have told me they have found that spasm occurs when the hip is extended or the ankle is flexed. One of my clients, who had been injured over 20 years before, had the goal to flex and extend his left ankle. In the past when he had been able to achieve this movement, he was unable to do it repeatedly because he would start to spasm. He was surprised not only at how quickly he was able to achieve this by learning to use his torso, but that the movement was sustainable. If the participants are not well practised in the **Feldenkrais Method**, they are likely to push themselves and make these symptoms worse.

Feldenkrais practitioners have described a number of ways in which their clients have learnt to manage their spasticity using **Feldenkrais** principles. For example Ginsburg (1986) described how Mark, with a C3/4 injury had strong spasms in his arms, trunk and legs that could shake his body out of his chair. His initial response was to unknowingly increase the intensity of the spasm by stiffening his neck and his breathing. Control began for him when he stopped trying to fight the spasm and let himself go into the spasm. Bost (1997) reported how getting her client, Michael, to keep his attention on his upper body, allowed his legs to remain still. She commented that the spasticity was inhibited when he shifted his attention to another part of his body.

Susceptibility to injuries.

Some people with SCI are susceptible to injuries such as dislocations. A couple of clients have told me how easily they can dislocate the hip joint and in his autobiography Matthew Sanford reports how he broke his femur doing yoga (Sanford, 2006).

Poor stability and mobility.

People with SCI frequently have poor stability (Wadhwa & Aikat, 2016). This means that lessons in sitting (and, of course, standing) may not be suitable for this group. As they spend so much of the day in sitting, their usual base of support is different from that of able-bodied clients. Whereas for an able-bodied person, the base of support is frequently the feet, for a person in a wheelchair the base of support is the sitting bones and feet for most functions.

Movements that may appear simple to an able-bodied person can be very challenging for someone with an SCI. For example, a movement such as rolling back and forward is complex and challenging for my clients with SCI. Feeling themselves is a challenge in itself and trying to add more challenging movements makes it even more difficult to feel. If the movements are too difficult, participants are likely to use effort and exacerbate the pain or spasticity. In addition, many of the starting positions and movements that are commonly used in ATM are too difficult for people with SCI. For example, a common position in ATM with able-bodied people is lying supine, knees bent, feet flat on the floor. One of the advantages of this position is that they can push their feet into the floor. There are many proprioceptors in the feet and participants can learn from this action. However, for people with SCI this is difficult. Most are not able to maintain that position and they may not be able to feel their feet, let alone push into the floor.

Limitations in mobility affect their ability to use constraints, a common strategy in ATM. Constraints serve the purpose of minimising movement in one area so that another has to move.

Many constraints require the participants to limit or prevent movement of the distal parts (e.g., the legs) so that the torso has to move. Constraints include bending the knees and placing the feet flat on the floor, keeping the arms straight and hands interlinked, placing the arm in a push-up position with palm flat on the floor, and crossing the legs. For people with tetraplegia, putting their palms flat on the floor can be difficult, if not impossible, as their hands are frequently relatively closed due to contractures. This means that they are generally unable to manage positions such as the push-up position. Crossing the legs in any way can lead to the risk of them getting stuck in this position if they spasm. I haven't yet found any clients who could lie on their backs with their knees bent and their feet flat on the floor.

Difficulties with movement may also be exacerbated by the fact that many people have metal in the spine (used to stabilise the spine) at the site of the injury. People with long-term injuries also have the added disadvantage of years of inefficient and painful movement habits to overcome. This means it may take a long time to relearn new strategies.

Sensitivity to pressure and cold.

I have found that a number of my clients with SCI have sensitivity to certain conditions such as pressure or the cold. Some cannot tolerate the firmness of the standard **Feldenkrais** table, let alone the firmness of the floor. They needed a thicker and softer surface to move or rest on than able-bodied people. This has meant that, for some clients, I have had to do FI on a hospital bed or place a duvet between them and the **Feldenkrais** table.

A history of challenge.

Many of my clients with SCI have tried a number of strategies to restore movement and manage the secondary issues of SCI such as fatigue, loss of bowel, bladder and sexual functioning, pressure sores, sympathetic dysreflexia (where the body goes into excess

sympathetic arousal which can lead to death) and the ensuing psychological consequences. Many of them had experienced repeated failures in achieving many of the functions that able-bodied people take for granted. Given this, I felt that it was important to create an environment of success.

Diverse capabilities.

Even when I limit the target population to people with SCI that can get on and off the floor, there is still a diverse range of capabilities. This means catering to a diverse range of needs. In addition to the diversity of capabilities, they are all individuals. Their disability is only part of what they bring to class. They have different personalities, backgrounds, interests and degrees of motivation and activity. For example, in Group 1 there was one participant who didn't engage in sport or exercise and another who played competitive basketball.

3. What was an appropriate topic?

Many **Feldenkrais** programmes revolve around a topic or theme that is relevant to the target audience, for example "Freedom in Your Jaw, Mouth and Breath" or "Pelvic Health and Awareness". At times the theme relates to a particular function, for example "Learning Intelligent Reaching". Whereas a number of people with SCI have reported improvements in functioning using **Feldenkrais**, I did not think that functional improvement was an appropriate topic for my programme as an implication behind this is that disabled people need to change in order to function in a mainstream environment. This is in contrast to the thinking behind the Social Model of Disability (see page 65).

Given that most, if not all, of my participants would have been subjected to, at times lengthy, rehabilitation I wanted to stay away from the rehabilitation paradigm where "problems

are generally defined in terms of inadequate performance in ADL [Activities of Daily Living] or in terms of adequate preparation for gainful employment" (DeJong, 1979, p. 13).

Trying to improve function can also become associated with using a lot of pain and effort for very little return and I didn't want people to enter the programme with an attitude of "trying". Consumer surveys (for example Hammell (2010)) have revealed that secondary issues such as pain or spasticity are more immediate issues for people with SCI and social and environmental modifications are limited in their capacity to reduce these symptoms.

Although research into the **Feldenkrais Method** has indicated that it is effective in reducing pain, **Feldenkrais** lessons generally do not focus on reducing on pain. Instead the focus is on movement; reductions in pain are a consequence of improved movement. I decided it was more appropriate to focus on teaching people to improve their comfort in performing the activities of daily living that they are already doing; a reduction in pain could be a side-effect.

One of the ways in which comfort can be improved is by improving postural stability which can lead to falls from wheelchairs and makes it difficult to accomplish everyday functions with ease. A number of studies have shown **Feldenkrais** to be effective in improving postural stability and frequently clients with SCI have noticed how their FI lessons have led to improvements in stability. For example, one of my clients (a keen horse rider) told me that the improved use of her pelvis through **Feldenkrais** (which resulted in improved stability) made a big difference to her horse riding.

The participants in Group 1 (three people with SCI) noticed improvements in their postural stability suggesting that this was an appropriate topic. As one (a wheelchair basketball player who had been using a wheelchair for 18 years) wrote "I have had about ten sessions with Cindy and noticed improvements in my balance and the way my posture is in my chair". He told

me that doing these ATMs had improved his basketball. Previously, when he went to pick up the ball, he used his arms to hoist himself back to upright. After doing the ATMs he found that he could use his trunk to bring himself up, leaving his arms more free to handle the ball.

4. What were the goals of my programme?

I had decided that the topic of my programme was postural stability. However, as the **Feldenkrais Method** is about learning how to learn, it was not sufficient to just have a goal of improving postural stability. In order to ensure that the participants had long-term benefits from the programme, my goals were centred on providing participants with tools and motivation to improve postural stability in everyday activities, even when the programme was completed. Given this my key goals were as follows.

- Participants have improved postural stability.
- Participants gain skills, knowledge and confidence to explore movement.
- Participants feel motivated to continue learning in this way.
- Participants enjoy the process.

5. What was an appropriate time frame?

In deciding on a timeframe I took into account the debate regarding the value of efficacy versus effectiveness research. Efficacy research is carried out under controlled experimental conditions which are often difficult to replicate in the real world. In contrast, effectiveness research examines interventions under real-world conditions (Ravesloot et al., 2007). Whereas efficacy research tends to have greater internal validity, effectiveness research tends to have greater external validity and the interventions are more readily translated into public practice. Action research is compatible with effectiveness research (Ravesloot et al., 2007). As I was

interested in making the programme widely available for people with SCI, I was most interested in conducting effectiveness research.

Whereas some research projects and programmes include intensive intervention, I wanted to ensure that participants could go about their regular lives while attending the programme and have time between sessions to reflect on what they had learnt. This seemed to me to be a more effective way of promoting habit change. In addition, the programme needed to be long enough to enable sustained learning yet not so long as to discourage commitment. In determining a realistic timeframe, I was guided by other **Feldenkrais** research projects. For example, studies with participants with multiple sclerosis included interventions with 10 ATMs (90 minutes long) over 10 weeks (Stephens et al., 1999) and eight ATMs (120-240 minutes long) over 10 weeks (Stephens et al., 2001). Studies with the elderly included 20 ATMs (60 minutes long) over 10 weeks (Connors, Galea, et al., 2011), 15 ATMs (60 minutes long) over five weeks (Ullmann et al., 2010) and 16 ATMs (40-60 minutes long) over eight weeks (Vrantsidis et al., 2009). A study with people with stroke included 15 sessions of two 35 minute ATMs over six weeks (Batson & Deutsch, 2005). In addition, at the time that I was developing my programme, physiotherapists from the Burwood Spinal Unit were involved in a research project with people with SCI. This project Spinal Cord Injury and Physical Activity (SCIPA) programme involved participation of three hours per day, three times per week over 12 weeks (personal communication, 2011). Based on this, 12 weekly classes of up to two hours duration seemed a reasonable commitment.

6. What was suitable content for the programme?

Each class included a discussion of observations since the last class (except in Lesson One), an introduction to the day's lesson, a demonstration using a model skeleton, an introduction to a **Feldenkrais®** principle, an ATM, post-ATM feedback and the issuing of

optional homework. An overview of the programme can be found in Appendix 4.1. Details are described below.

Discussion of observations since the last class.

Frequently public ATM classes do not allow time for discussion at the beginning of class. For people that are familiar with the **Feldenkrais Method**, this is relatively efficient. However discussions at the beginning of the classes give participants the chance to share and reinforce their learning.

Introduction to the day's lesson.

An introduction to the day's lesson allows participants to prepare for what is ahead. In "Anatomy of a Workshop", Goldfarb (2006) recommends that, prior to beginning an ATM, the practitioner tells the participants what the lesson is about, what is going to happen and how long the lesson will be. This meets the needs of conceptual learners who learn better if they have an overview of what they doing.

Using a model skeleton.

A demonstration skeleton is used frequently throughout **Feldenkrais** trainings. This helps participants to see whereabouts in the body the bones are and how movement occurs in the joints, and to visualise movements. Seeing a three-dimensional image of a hip joint, for example, helps to improve the participants' images of their own hip joints and visualise how the hip joints are involved in their own movement. In this phase, I used pictures of the skeleton to demonstrate the different aspects of the skeleton. However I arranged to borrow a human-sized skeleton from the Physical Education department for the next phase.

Introduction to a Feldenkrais principle.

During our **Feldenkrais** training we learnt a number of movement and learning principles that guided our exploration of movement. For me, learning these principles enhanced my commitment to the lessons. It enabled me to understand the logic behind what we were doing, modify how I performed the movements and develop my own movement explorations. Bearing this in mind, I take opportunities to educate clients on why I work the way I do. For example, I find that bringing the client's attention to the proprioceptive sense seems to enhance the effectiveness of the lesson and so I usually do a body scan at the beginning of every FI lesson. One client could not see the point of the body scans but, once I explained the importance of proprioception, he was able to see the rationale and as a result became more committed to doing the scans.

For my programme I decided to introduce the ideas of paying attention to the proprioceptive experience and making sensory distinctions (both of which are important to learning movement) in Lessons One and Two. In Lessons Three to Nine I decided to introduce the "attributes of optimal movement". These come from a list of movement principles compiled by **Feldenkrais** practitioners, Ehrman and Goldfarb (2002), which they define as follows:

- "Breathing" - Our breathing is unimpeded and variable according to the needs of the situation.
- "Moveability" - We are able to move in any direction with equal ease and without preparation.
- "Distribution" - Movement is not limited to one area of the body, but is distributed throughout the whole body. When we move, every part of the skeleton is involved in the movement.

- “Smooth Flow” - Movement is uninterrupted and flows easily.
- “Dynamic Foundation” - An appropriate base of support is underneath the centre of gravity so that weight shifts easily in response to demands of movement. The base of support is aligned with the direction of motion.
- “Coordinated Action” - Muscles work in proportion to their size. Larger muscles make a bigger contribution and the peripheral muscles guide the motion. Fine motor control is performed by the hand, but the control is supported by the larger muscles of the torso and arm.
- “Congruence” - When we move all parts of our body in a way that is congruent or aligned with the intended movement, we can increase the power and efficiency of our movement.
- “Transmission” - Force moves through the joints, rather than into them. There is no interference from chronically contracted muscles or from high tonus.
- “Central Initiation” - The biggest boney mass moves first (Ehrman & Goldfarb, 2002).

For my programme I decided to describe them as “attributes of sustainable movement” as sustainable movement seemed a more reasonable goal than optimal movement for people with SCI. I also thought it was important to distinguish between the ability to do a movement and to sustain a movement without interference from pain, spasticity or fatigue.

The ATM lessons.

A defining feature of SCI is the nature of the sensory motor loss which occurs predominantly in specific segments of the body. This leads to loss of stability. After SCI you can expect there to be loss from at least the pelvis down and for clients with tetraplegia, the neck down. Being central and having some of the larger muscles and bones, the torso is key for stability and central to movement. Given this, I decided to focus on teaching the key movements

of the torso. In doing this, I focused on teaching them to move the proximal parts (e.g., the pelvis and ribs) as opposed to focusing on the distal (e.g., the feet, head and hands). When I first started doing **Feldenkrais**, I found that lessons with a distal focus were confusing, difficult and at times unpleasant. Benefits were generally temporary and relatively superficial. I believe this was because I had very little awareness of how to organise myself proximally. I had limited sensation in the torso so when I focused on moving an arm, for example, I tended to brace. A breakthrough moment for me was in the second month of my **Feldenkrais** training when the trainer introduced us to the key movements of the torso which include flexion, extension, rolling, side bending, rotation, leaning forwards and leaning sideways Once I understood and could feel these movements I was able to start feeling how the movement of the distal parts are influenced by the proximal which is a key **Feldenkrais** principle.

I see similar issues with my clients who also have limited sensation and movement in their torsos. Generally, when I have encouraged clients to focus on the hand or arms they tend not to benefit as much. Feeling the larger neglected paralysed part of themselves move has been more rewarding and has the potential to provide more of a sense of wholeness. Although I would not completely neglect the distal parts, I prefer to keep my focus on the proximal.

Once participants have learned some key proximal movements, they could start to connect the movements of the torso to the extremities. By working with the torso they could relax overworked torso muscles and potentially release any nerve entrapment. In addition, I felt that these concepts would be easy for clients to grasp.

Most of the ATMs I chose were performed lying on the floor. As people with SCI tend to be physically unstable, trying to work from a sitting position is more challenging. All the lessons with Group 1 were performed lying on the floor. They enjoyed this as they spend all day sitting. I

introduced two sitting lessons with Group 2 but they did not enjoy these as much or notice as much change from these as the lying lessons. For me personally it took many ATMs in lying before I was stable enough to benefit from sitting lessons. In addition, the pelvis is easier to access from the lying position. However, I still thought it was important to include some sitting lessons as it would give them an opportunity to practise movements from sitting in a chair and their experiences could differ from my own.

Many of the lessons were performed from side lying in the flexed position. As for many their contractures are pulling them into flexion, this has become the normal or "neutral" position. When you allow them to move from this flexed position, they are more able to stay within the comfortable range, the lessons are more pleasurable and they are more able to feel or engage themselves. In FI, I have often worked from the flexed position using movements such as rolling or lying on the back and bringing the knees to the chest. This has generally been successful. For example, one client with complete tetraplegia had a lot of spasticity and loss of sensation. I rolled him onto his side and into flexion and rolled him back and forth. He said that he could feel his whole right side and he thought it would be great for his spasms. Afterwards his spasticity had reduced and he had a lot more control of his right arm. The next day he told me that his spasticity had reduced dramatically as a result of the lesson and he still had more control of his right arm.

Most the lessons I taught were modifications of the lessons I had previously taught to able-bodied people. In modifying the lessons, I focused on highlighting the movements of the trunk while at the same time giving them the opportunity to feel the whole body in movement. I also sought ways of simulating some of the experiences of able-bodied people. For example, I wanted to give the participants the experience of pressing their feet against a surface. In able-bodied people this stimulates the proprioceptors. As the participants of Group 1 were unable to

lie with their knees bent and feet flat on the floor (which is commonly done in able-bodied lessons), I decided to explore the idea of pressing into the feet from the straight leg position. During the lateral flexion ATM, I got them individually to feel how lengthening from the waist in lying allowed them to press their feet into my hands. This replicates part of the action of walking whereby the foot presses against a surface causing pressure into the foot and thus feedback into the system. As they were able to achieve and feel this movement, I decided to introduce a step in the lateral flexion ATM in the next phase where participants press their feet against the wall. This would be more difficult than pressing into my hand, but would create the effect of an artificial floor and would enable them to do the movement without assistance.

In developing and structuring the ATMs, I used guidelines from Dr Goldfarb's "Anatomy of a Workshop" (Goldfarb, 2006) and direct advice from Dr Goldfarb himself. For example, he recommended that each ATM begin and end with a "reference movement" (a movement that is clearly based on everyday function) so that participants can observe any changes that may have occurred as a result of the ATM and see the relevance of the lesson to their daily lives. He also recommended that lessons be divided into four to seven "acts", with each act involving a different position and/or "constraint". Dividing the lessons and acts made it easier for me to recall the lessons when teaching.

Post-ATM feedback.

Feedback from participants after the ATM enables participants to share their experiences. Having peers discuss their own experiences can highlight changes participants may not have recognised as being a consequence of the lesson. As I mentioned in Chapter 1, participants that are new to the method sometimes do not make the connection between the **Feldenkrais** lesson and the subsequent improvement. However when three or more people in the room report the

same change, it becomes easier for them to recognise that the change they are noticing is a consequence of the lesson. For example, after the first lesson with Group 2, one of the participants remarked that her knee pain had gone. At this point other participants reported that their persistent pain had also disappeared.

As two of the participants in Group 1 had been my FI clients, they were familiar with the sorts of changes to be expected from a **Feldenkrais** lesson. However, the participant who was new to **Feldenkrais** tended to stay after class (sometimes up to an hour) to discuss his experiences and learn more about the method.

Homework.

As one ATM lesson per week does not provide a lot of opportunity for participants to change movement habits (given that for the rest of the week they are practising their old movement habits), I thought it would be useful to have some way of practising what they had learned in class. One way was to provide recordings of ATM lessons taught by **Feldenkrais** practitioners other than me. This could give participants the opportunity to experience the teaching of other practitioners and thus reinforce and expand their learning.

I searched widely throughout the International **Feldenkrais** community to see if anyone had recorded ATM lessons for disabled people. I found none. I then reviewed over 250 recorded ATM lessons, searching for lessons that (with some modification and imagination) could potentially be used by people that have limited use of legs and pelvis. As a result I found 17 lessons that met these criteria and reinforced the lessons I was teaching. I contacted the authors of those lessons (with the assistance of Dr Goldfarb) and asked for their permission to use them.

The lessons were up to about 45 minutes long. The majority of them were on CD. However I also included lessons from “Pregnant Pauses” (Questel, 2010), a series of lessons by

Alan Questel which were available on DVD. On these DVDs, Questel presents a series of ATMs to a group of pregnant women. For each lesson he demonstrates the key movements of the lesson with one of the participants.

Most of the lessons involved movement. However **Feldenkrais** practitioner, Deborah Bowes, said that she found it useful when working with people with SCI to get them to imagine the body being made up of five lines. Clients imagine the line to be flat, filled with water, filling with water and water being let out. She and fellow practitioner Cliff Smyth developed a CD "The Primary Image" on which they recorded this lesson "Five Directions" so she offered to let me use this lesson for my programme. A full list of the homework ATMs can be found in Appendix 4.2.

As these lessons were designed for able-bodied participants, they would need to make some modifications (which I would recommend) such as visualising some of the movements or placing a roller under the knees for lessons that required them to bend the knees when lying on the back. I thought that if they got into this habit, they could more easily adapt to other able-bodied lessons. I also decided to provide them with rollers and camping mats to take home for use when practising.

I also developed homework sheets for Phase 2 which could serve as reminders of what they had learnt that day and the homework ATM. Each homework sheet included the **Feldenkrais** principle that they had covered that day, a photograph of the aspects of the skeleton that they had focused on in the lesson, the title of the homework ATM lesson and guidelines on how they could modify the lesson to meet their needs.

7. What strategies would I need to teach my target audience?

The characteristics of the target audience affect the strategies used when delivering ATM lessons. Some of the key strategies I used included: focusing on enhancing the proprioceptive sense, encouraging participants to use their imagination, using the visual sense to convey new movements, using supports, providing individual assistance, taking the classes slowly and limiting the number of movement variations.

Focusing on enhancing the proprioceptive sense.

Some lessons bring more attention than others to the proprioceptive sense whereas some bring more attention to the strategies that one might use to achieve a movement, for example transferring the weight across the sitting bones makes reaching easier. The assumption is often that the participants have some sense of where their sitting bones are. Transferring their weight over the sitting bones reinforces that sense. For people with SCI, they may have no sense of where their sitting bones are so using a range of other strategies to help them feel may be required.

Many able-bodied people aren't aware that their proprioceptive sense is less than optimal so it is not something that they are consciously seeking. All my SCI clients to date have had loss of sensation and so regaining sensation has a lot of meaning for them.

One way of increasing proprioception is to direct attention to those parts of the body with limited sensation prior to movement. In FI, I spend a lot of time clarifying joints (using techniques such as small movements and pressure) before I begin a larger movement. For example, one client had a lot of difficulty feeling her right leg. I highlighted her leg and foot through pressure and the application of small circles to the base of her foot before moving her. She said that because I had highlighted her leg, she was then able to feel her leg moving.

Whereas this amount of touch is not generally feasible in ATM, there are other ways to increase the clarity around the joint before introducing a new movement. Before instructing clients to initiate a movement that is new for them, I will frequently get them to initiate a familiar or easy movement from a previous lesson to increase the awareness of the area of the body that they are moving. For example, in the lateral flexion lesson, I get them to roll forward and back (as they had done in a previous Lesson) so they could re-experience the hip and shoulder moving apart and together in a familiar movement.

Encouraging participants to use their imagination.

Using the imagination is an effective way to increase proprioception and improve movement. A strategy used in **Feldenkrais** is the "body scan", a relaxing visualisation where clients bring their attention to various parts of the body. I conduct a body scan with my clients at the beginning of every FI and ATM. Even my most disabled clients, who have initially believed that they have no sense of their body, have been able to do a body scan. As a result their body awareness is usually heightened. They report that, with practice, it becomes easier to do. Even the act of focusing attention is a useful practice that can lead to positive outcomes.

A number of my clients adopted body scans as a regular practice and reported positive benefits. For example, one client with a complete injury described how, when he did a body scan, the line between the paralysed and unparalysed part of his body became blurred giving him more of a sense of wholeness. Another used them because he found it helped him sleep and another found it helped him with pain.

I suspect that body scans alone can influence joint stability. When I first started doing **Feldenkrais** I found most ATMs painful and it was difficult for me to feel the parts of the body

that I was supposed to be moving. Eventually I did long body scans (sometimes for 45 minutes) daily. I found this led to immediate improvements in my stability.

I have found that imagining movement can lead to the beginning of movement. For example, some of my clients have been able to have some sense of the pelvic floor and, with practice, they have been able to increase this sense and restore movement. One of my clients was particularly interested in improving his pelvic floor control. He was diagnosed with complete paraplegia but found that, with practice, he was able to increase his ability to raise and lower his pelvic floor. By placing his hand on the pelvic floor he was able to test whether or not he was actually moving it and he found that he was. He also found that, with practice, sensation returned to his penis. Another client with a complete injury said that after working with drawing up and releasing the pelvic floor, she felt an urge to urinate for the first time since her injury three years before. Dr Ginsburg describes how he uses the imagination to create "micromovements" which enable one to explore movement without intention, direction or thought of trying to function. Ginsburg writes:

> Micromovements accomplish this through a kind of play with tiny waves of movement that one can try at any place in the body. By letting the movement spread without conscious intention, one may feel the waves of movement at some new place, or even spreading throughout the body. A paralyzed person can, for example, experience how this movement feels some place far below the level of injury. An outside observer may see no apparent change - or the beginning of tiny movements. Because there is no intent other than to enjoy and flow with the experience without effort, the compensations a paralyzed person usually makes in trying to function cannot interfere with the process. At the same

> time, awareness and sensitivity are enhanced, and there is an experience of aliveness in the usually “dead” body-space below the injury (Ginsburg, 1986, p. 35).

Irene Lober (who later trained to become a **Feldenkrais** practitioner) was told that she would need a wheelchair for the rest of her life. Despite this, she was able to get rid of her wheelchair, ski and climb hills. She documents her recovery in her Master's thesis (Lober, 1987) where she describes how she used "Micromovements" to assist her recovery. She discovered that:

> these first microsensations could develop into a potential for directed movement: an unexpected tingling would develop into a larger vibration, into sudden uncontrollable twitches of muscle-bundles, and then there would be the moment when image and vibration would meet in the slightest flicker of contraction, with the flutterings of more vibrations around it.
>
> My hypothesis is that the combination of paying attention to micromovements and reenforcing (sic) them through repetitious thoughts and images, using them as starting points for expanding sensation, is able to create nerve recovery and/or nerve growth. (Lober, 1987, p. 29)

Even the intention to imagine can influence movement. At one point I got a client to imagine that he was rolling his legs in and out. He looked at me as he attempted to do this and said he could not imagine this. However, as he was looking at me, he was performing the movement.

Using the visual sense to convey new movements.

Sometimes participants need a visual image of a movement before they can imagine it. One way in which the visual sense is used is by the use of the skeleton as described above. I recall attending an ATM run by a Christchurch **Feldenkrais** practitioner. At the beginning of the lesson we walked around the room, noticing the comfort and stability in our walk. Using the skeleton, she then showed us the shape of the foot and how the foot moved at the ankle joint. Once again we walked around the room and I was surprised at how much my ease and comfort in walking improved just from seeing that image.

Another way of using the visual sense is to demonstrate the movement. When I first started doing **Feldenkrais** I often could not even imagine the movements that we were required to do in ATM. I needed to see visual representations of the movements. We are not encouraged to demonstrate movements when teaching ATM as this can encourage participants to copy the practitioner, rather than discovering their own way of doing the movement. In ATM, able-bodied participants learn and understand new movements via the proprioceptive sense. They can <u>feel</u> that one way of moving is easier than another. Possibly because the proprioceptive sense is challenged with people with SCI, I have found that often clients with SCI have been unable to imagine the movements in the way that my able-bodied clients can. The movements don't immediately make sense to them in the way they do for someone with intact proprioception. This means that I need to explain movements in more detail or demonstrate a movement to illustrate, making it clear that this is roughly the position or movement that we are working towards .

During the development of my programme, I attended a workshop by Professor Susan Hillier, neuroscientist and **Feldenkrais** Trainer. Susan Hillier found that using the visual sense has been really helpful with working with people with stroke; that unlike many able-bodied

people they had difficulty feeling where their bodies were. I thought the same could be true for this group who has difficulty feeling where the body is.

Imagery can also be used to help participants understand some movement concepts. When I first started doing **Feldenkrais** I had a lot of difficulty pushing or even imagining pushing. Practitioners tried to teach me to push them away with my arms or to push into the floor with my feet. I could not feel this idea and this difficulty translated into difficulties in function in everyday life. For example, lifting (which requires pushing the feet into the floor) was a very difficult activity for me. I worked out that, in order to learn to push with the limbs, I first had to learn to lengthen the limbs. And in order to lengthen the limbs, I needed to learn to spiral them. I started with imagining my limbs moving in large spirals and then tightening the spirals until they became a push. When working with clients, I sometimes get them to experience how moving the limb in a spiralling action enables them to lengthen the limb and feel its connection with the torso. For example, one of my clients had a lot of pain in his arm and wanted to lengthen it by stretching but was unable to. I suggested that instead of trying to stretch his arm he spiral it. He found that this improved his ability to lengthen his arm and decreased the pain. I incorporated spiralling of the arms into the rotation lesson when working with Group 1. Participants felt that focusing on spiralling the arms lead to a sense of spiralling throughout the whole torso and they were able to reach further.

Using supports.

I frequently incorporated the use of supports in the ATMs as I had found them helpful in FI. For example, most of my clients had no or minimal controlled movement of the pelvis before I started to work with them. However, frequently they have managed to improve their control with the use of a roller. To achieve this, the client would lie on the side with the upper leg bent at

right angles. The roller would lie parallel to the body with the lower leg resting on it which took the weight of the upper leg and reduced friction between the two legs. From this position the client would push the roller forward (away from them) and back (towards them). Most clients started by flinging the shoulder to move the pelvis. With guidance from me and focus they were eventually able to move the roller with the leg and pelvis. Once they could do this, I taught them to push the roller in different trajectories. I found that even after 29 years, a client diagnosed with complete paraplegia was able to restore movement to his pelvis and leg and feel his hip joint by the second session by using this technique.

In an ATM for able-bodied students, practitioners may ask the participants to lie supine, knees bent, hands behind head and lift the head thus flexing the spine. When working with Group 1, I found it useful to use supports to give participants a head start. One of the ways of doing this was to place squabs behind the upper body so that they began the movement in the flexed position and there was less weight to lift. Once they had performed this initial step, it was easier for them to lift the head from the supine, knees bent position. In his observations regarding Moshe Feldenkrais's work with a man with an SCI, Ginsburg emphasises the importance of decreasing the weight that the client is required to lift:

> Feldenkrais pointed out that his student with her atrophied legs and pelvis could not feel and did not know where her body was below the point of injury. Thus, even if some motor impulse could get through, it would be lost in the total confusion of his client's sensory image below the point of injury. He also pointed out that if you want some weakened muscle to move it would receive only a tiny fraction of an impulse from the central nervous system. For anything to work it must be effectively weightless (Ginsburg, 1980, p. 34).

Providing individual assistance.

At times when individuals in Group 1 were having trouble with a particular movement I gave them individual assistance. Sometimes the best way to enable a participant to understand a movement was to give them hands-on assistance as we do in FI. When I have physically guided them in performing the movement, it has enabled them to feel the movement and then imagine it. This can be the first step towards a movement.

However, at times, it was challenging to identify what was getting in the way of them being able to perform a movement. I did not know if it was neurologically impossible for them, or if with some visualisation or change of strategy it could be possible. I needed to keep them open to possibilities without pushing them so they felt like they had failed if they didn't achieve what I asked of them. Exploring different ways of solving the problem frequently produced successful results. For example, one participant in Group 1, who had complete paraplegia, could not feel his legs at all. When I asked the participants to rest the leg on the roller, his calf and foot dropped off the roller whenever he tried to roll it. We tried several ways of remedying this including having me hold his leg and (at his suggestion) using Velcro to attach the roller to his trouser leg. Although these strategies worked, I felt it would be useful if he could do this unassisted and without the Velcro. I suggested that he reduce the distance he rolled forward and pay attention to what happens throughout himself just as the leg is about to fall off. He did this and found that he could then push the roller further forward without the leg rolling off. It appeared that as he became more aware of the movement throughout his whole body, he was able to gain some control of the leg. Despite the fact that he was unable to feel the leg or know how he knew his leg was about to fall off, he was able to learn this and increase the size of the movement again without the leg falling off.

Taking the classes slowly.

When I teach ATM to able-bodied people it often feels to me like a choreographed dance. There is a sense of flow and most of the class is able to achieve the movements I am asking of them. However, when I taught Group 1, I found that the lessons were much slower and more disjointed. Participants took longer to grasp how to do the movements and frequently needed assistance. Allowing them more time to focus on awareness, quality of movement and breathing made it easier to restore their body image and maintain a state of relaxation. Whereas it is ideal to maintain a state of relaxation in any ATM class, this becomes more important when working with people with SCI as this helps to keep pain and spasticity under control.

Limiting the number of movement variations.

Taking it slowly has influenced the number of possible movement variations in a lesson. In Dr Goldfarb's words "Lessons can run the gamut from "many repetitions of few variations" to "many variations each with only a few repetitions." Usually beginner lessons are of the "many variations" variety because students more easily stay engaged. Lessons with "many repetitions" often bore, frustrate, or just plain lose newbies" (personal communication December 2011). Whereas this seems to be true for able-bodied participants, I found that with Group 1 I needed to have participants perform many repetitions of few variations. They took longer than able-bodied people to change positions and if I tried to fit too many variations into the lesson, they would get caught up in trying to achieve the mechanics of the movement. This would not allow them enough time to pay attention to the quality of the movement.

Dr Goldfarb agreed that ATM teachers needed to understand the importance of limiting the number of variations when working with people with SCI "This isn't a distinction that I learned to make in my training. I learned a bit about it in my practice … I can certainly see how a

teacher could mistakenly conclude that a student with a SCI somehow was less able to benefit from ATMs, not understanding that the very nature of the standard approach to teaching wouldn't be optimal here" (personal communication, March 12, 2012).

8. What resources would I need?

In order to run the classes there were some resources I needed to organise in advance. These included both physical assistance and custom-made equipment.

Assistance.

Even though there were only three participants in Group 1, running this class was more work than managing a class of 16 able-bodied people, in part because they needed more individual assistance. Some of the assistance required the skills of a **Feldenkrais** practitioner. We have a limited number of **Feldenkrais** practitioners in Christchurch and assisting would have been a big commitment, particularly as it would need to be on a voluntary basis given my limited funding.

Some of the assistance could have been provided by an unqualified assistant. One of the Physical Education lecturers recommended that I use volunteers from the University of Canterbury course for Physical Education of Athletes with Disabilities (SPCO308) to assist. A requirement of SPCO308 is that they spend 10 hours working in a tutor approved special needs environment. Although they would not be familiar with the **Feldenkrais Method**, they would be able to help with activities such as helping participants in and out of their chairs, handing equipment to participants, helping participants to keep their legs on the rollers and any administrative issues that might arise so that I could focus on teaching. This would also give the volunteers the opportunity to learn about the **Feldenkrais Method.**

Equipment.

Usually when I teach ATM classes to able-bodied students they lie on a carpeted floor or thin foam camping mats purchased from The Warehouse. For my ATM classes with Group 1, I knew that the carpeted floor would not be soft enough so I supplied camping mats. However we found that the camping mats were not quite large enough for some of the movements and caused friction when participants performed movements that involved sliding any part of the body across the mat. This made movement even more difficult, given that they had difficulties with movements already. I was also aware that the camping mats might not be soft enough for some participants.

For able-bodied classes I also supply towels that they can fold to use as head rests, adjusting the size according to their own needs. For people with tetraplegia it was fiddly to fold the towels so I folded the towels into old cushion covers. This was adequate but I thought foam would be more comfortable and supplying headrests of varying sizes would enable more flexibility for them. In addition, Māori cultural beliefs state that you shouldn't place your head where you have been sitting so I realised that I would need to supply more supports than I had. I decided to use the towel-filled cushion covers and squabs as extra thick supports to support the pelvis in lessons where pelvic support was required and provide custom-made foam support for the head.

Given these requirements I had equipment tailor-made for the next phase. Details that needed consideration included the thickness of the mats, the density of the foam, the texture of the fabric, the size of the mats, the fabric of the rollers and how it would work against the mats. Much of the equipment was funded by the International Feldenkrais Federation Esther Thelen

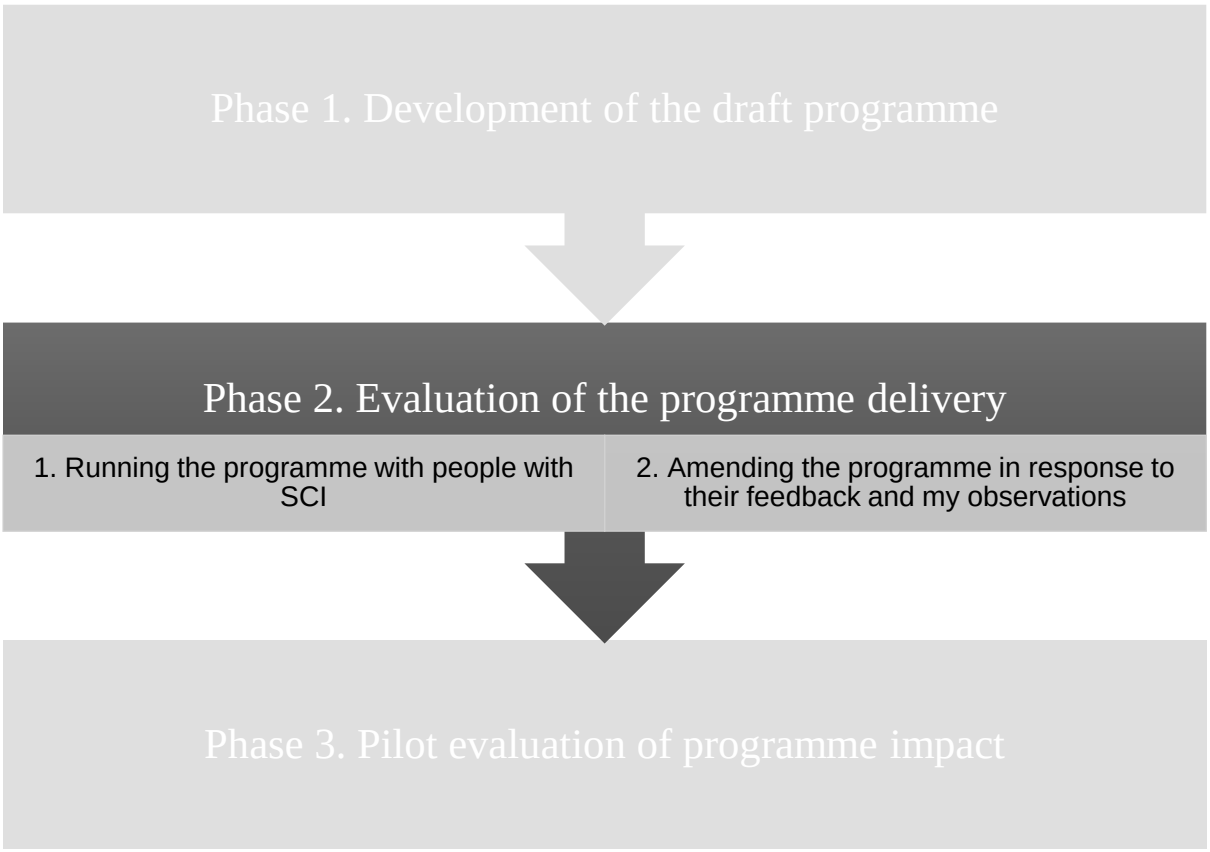
Research Award and the Canterbury Branch of the Federation of Postgraduate Women and included:

- cotton covered thin foam head rests - 40 cm x 18 cm x 30 mm (two per person)
- cotton covered thick foam head rests - 40 cm x 18 cm x 60 mm (one per person)
- PVC covered foam mats – 2.3m x 1.3m x 30 mm
- Rollers - 90cm long, 150 mm diameter, covered in non-skid material (two per person; one to take home to use for homework)
- double camping mats (to take home to use for homework)
- dense foam pads (for placing under the feet or buttocks to make height adjustments).

In the Next Chapter

In this chapter I have described how I developed the programme. In the next chapter I will discuss Phase Two in which I evaluated the programme delivery with a group of five people with SCI.

Chapter 5. Phase 2: Evaluation of the Programme Delivery



In the previous chapter I described how I developed my programme. In this chapter I will describe Phase 2 of my study where I evaluated the programme delivery in response to my observations and feedback from a group of people with SCI.

Purpose

The purpose of this phase was to determine the feasibility, relevance and preliminary effectiveness of the programme, and modify the programme accordingly.

Research Questions

1. How feasible was the programme?

2. What was the nature of the learning environment?
3. How appropriate was the content for this group?
4. What were the preliminary effects of the programme?
5. What changes would I need to make to the programme?

Participant recruitment

Participants were a group of five volunteers with SCI who met the following criteria.

1. They were capable of getting on and off the floor unassisted.
2. They were over the age of 18.
3. They were able to communicate effectively and understand English instructions.
4. They used wheelchairs.

Recruitment took place between September 2012 and June 2014[1]. Potential participants were informed of my programme via a number of sources. These included the Burwood Spinal Unit; New Zealand Spinal Trust (NZST); the Catwalk Trust; representatives of disabled community groups such as the Halberg Trust, the KiwiAble Network, the University of Canterbury Disability Resource Service, and Parafed Canterbury; community health professionals; the **Feldenkrais** community and the local community. Forty-five people responded to my initial recruitment. Of these, seven people were based in and around Christchurch and fitted the criteria. I sent all potential participants an Information Sheet (Appendix 5.1), a Consent Form (Appendix 5.2) and a Participant Details Form (Appendix 5.3).

During the month of June 2014 I consulted the seven interested participants that met the criteria to confirm whether or not they were still interested and to confirm a time that suited the

[1] I had a mild head injury at the end of September and had to suspend my PhD for 18 months.

majority. Initially I got them to roughly state their preferred times and to let me know if there were any times that they definitely couldn't make. During this time, two of the seven withdrew as they didn't feel that they could commit to the full 12 week programme.

The participants.

There were five participants (two women and three men), ranging in age from 36 – 53. One participant identified as a New Zealand European/Māori, three as New Zealand European and one as a Māori/Cook Islander. Two were working full-time, two part-time and one was a househusband seeking employment. Qualifications ranged from no qualifications to tertiary qualifications. Three participants had incomplete tetraplegia, one had complete tetraplegia and one had incomplete paraplegia. The duration of injury was between 19 and 34 years.

One stated that she did not exercise. The other four reported doing activities such as gardening, sport and gym work. Two of the four that reported exercising said that the exercise was curtailed by pain and injury. In her initial e-mail to me, Participant 2 reported a significant scoliosis. None of them used relaxation strategies such as meditation, visualisation, Biofeedback, Autogenics, yoga or Tai chi although one stated that he read before bed at night as a form of relaxation. One of the participants had previous experience of **Feldenkrais.** The other four had had no exposure to **Feldenkrais** prior to being recruited for this project.

Procedure

The participants agreed that they could meet on Tuesday evenings. Three of them had wanted to attend during the day - they had sporting and family commitments. However, the other two were working full-time and were only available in the evening so attending during the

evening was a compromise for three of them. In the end, the programme ran for 12 weeks on Tuesday nights from 26 August 2014, 6.30 – 8.30 pm.

Setting.

The programme was held in Clinic Room One at the Health Sciences Centre, Waimari Building, College of Education, University of Canterbury, Dovedale Ave. This room was just large enough to accommodate the five participants and equipment, had video facilities and dimmable lights so that participants would not be exposed to glare when lying on their backs.

Disabled facilities at the Health Sciences Centre included one disabled toilet. Another disabled toilet was available next to the Otakaro building (about five minutes wheeling time from the Health Sciences Centre). Because the programme was held at night, there were plenty of parking spaces available for participants including two existing disabled parking spaces and the visitor parking spaces. These were about three minutes wheeling time from the Health Sciences Centre.

Equipment and resources.

In addition to the equipment I had developed in the previous phase, I took a fan heater (as many people with SCI have circulatory problems and so feel the cold) and borrowed a full-size skeleton from the Physical Education department for demonstration purposes.

I recruited two volunteers from the University of Canterbury course for Physical Education of Athletes with Disabilities (SPCO308). The volunteers' roles were to

- help participants in and out of wheelchairs if necessary;
- take head rests and rollers to participants as required;
- occasionally help participants change position if necessary;
- help with doors;

- hand out homework;
- be a backup if there was an emergency; and
- assist with packing up at the end of each class.

Data Collection

I collected data from several sources including:

1. my notes from the preliminary interviews;
2. emails and texts from participants;
3. participant feedback during the programme;
4. my observations during class;
5. my observations from the videos;
6. feedback from the volunteers; and
7. feedback from participants in the months following programme completion.

Three to six weeks before the programme began I interviewed each participant individually for approximately one hour. Interviews took place at locations that suited the participants such as their home or workplace. The interviews gave the participants the opportunity to discuss any concerns or issues and their hopes and expectations. They also gave me the opportunity to take their needs into consideration in my planning, pick up the Consent Forms and fill out the Participant Details Form. Questions included “how much do you know about the **Feldenkrais Method**?” and “are there any specific areas of pain or triggers to spasticity you would like me to be aware of?” During this interview I took hand-written notes.

Throughout the programme, participants were invited to give feedback on issues such as how difficult they were finding the movements asked of them, how clear the instructions were, and how interesting and relevant they found the material. Participants were invited to give feedback in a number of ways. They could give feedback throughout the classes, five to 10 minutes was set aside at the end of each class to enable further feedback and a group discussion was held at the end of the series of classes. Participants were also invited to contact me by e-mail or phone if they had further issues that they wanted to discuss. The classes were videoed, enabling video-mediated recall of each session and participants' feedback. Videos were made available to participants on request.

At the end of each class when the participants had left, I had a brief discussion with the volunteers about any observations that they had made. Immediately after class or the following morning, I wrote up any observations whilst they were fresh in my mind. Jorden, one of the volunteers, also sent me his written commentary on the effects of the programme on the participants which critiqued the programme and gave thoughts on how it could be improved.

Data Analysis

I analysed the data using a general inductive approach, a systematic approach for analysing qualitative evaluation data which is commonly used in health and social science research and evaluation (Thomas, 2006). General inductive analysis differs from deductive analysis (which is used in hypothesis testing) in that it enables the evaluator to identify significant unplanned or unanticipated effects of programme implementation (Thomas, 2006). Following Thomas's (2006) guidelines I used the following process.

I reviewed videos from Weeks 1, 9 and 12, preliminary e-mails from participants, my hand written notes and Jorden's assignment. My reasons for choosing to begin with Weeks 1, 9 and 12 videos were that Week 1 was the first lesson for all participants, Week 9 was the first group activity and the last lesson for Participant 5 and Week 12 was the last lesson for the other four participants. While reviewing the material, I identified segments of data made up of comments or observations that provided answers to my research questions. For example, in Week 12, Participant 1 described how "I tried my Feldenkrais to turn" when driving through a difficult intersection. This comment seemed to pertain to the question "How relevant was material to the group?"

I then reviewed the segments of data that I had identified as relevant, creating categories (or themes) with labels which described what the segment was about. For example, the comment above, "I tried my Feldenkrais to turn", was labelled "Function". This label was given to comments on the relevance of the lessons to their daily function? Another example of Function was "There was definitely some relevance in that last session that we did last week to what I do day to day" (Participant 4, Week 12).

Next I reduced the overlap and redundancy among the themes by amalgamating some themes and splitting others. For example "Function" was amalgamated with "Stress Management" (comments on the relevance of the lessons to managing stress in everyday life) and "Pain management" (comments on the relevance of the lessons to managing pain in everyday life). These were all grouped under the theme of Practical application" which addressed the issue of whether or not they found the lessons applicable to their daily lives?"

Next I reviewed the comments that I had collected and viewed the remaining videos, checking to ensure that there weren't any new themes and whether or not there were more

appropriate comments providing examples of the themes. I was unable to discover any new themes relevant to my questions in the final nine videos so was able to assume that a point of saturation had been reached and write up my report.

Establishing Trustworthiness

According to Lincoln and Cooper (1985, cited in Thomas 2006) one of the most suitable methods of assessing trustworthiness is stakeholder checks. Stakeholder checks involve enabling people with a specific interest in the evaluation, such as participants, to comment on the themes or interpretations made. To establish trustworthiness, I gave the participants the opportunity to review the report to ensure they agreed with the report and were comfortable with the comments I chose to use.

Findings

The feedback and observations from this phase enabled me to answer my research questions and in doing so evaluate the programme delivery and make decisions on what changes needed to be made for the next phase. In this section I will outline my Phase 2 findings.

1. How feasible was the programme?

The answers to this question were divided into four themes:

- ATM requirements;
- Attendance;
- Lesson length; and
- Homework.

With some minor modification participants were able to achieve the ATM requirements. A significant issue was getting back into the chair from the floor but using a **Feldenkrais**

strategy this became possible for all participants. Attendance ranged from 7 to 12 classes with reasons for absence including illness and injury, family commitments and moving house due to earthquake repairs. Mobility issues made it difficult for them to get to and from class. Participants were happy with the length of the lessons. There was very little uptake of the homework CDs even though they all felt that doing them would be valuable for reinforcing their learning. Issues preventing them from doing homework included finding time and space, and the difficulty of getting onto the floor. However the participants spontaneously practised movements they had learned in class and Participant 2 found Alan Questel's Pregnant Pauses DVDs very useful. This is outlined in more detail below.

ATM requirements.

On the whole participants coped well with the requirements of the lessons. However there were times when participants had difficulty with what was asked of them. At times it was necessary to adjust the movement, encourage participants to rest frequently with the movement, get them to refrain from the movement, do the movement from a different position or visualise the movement. Even though I found it a fine balancing act to ensure that I challenged them enough without over challenging them, we seemed to find a way in which most of the participants were able to take part in most of the lessons in some way. As Jorden, the student volunteer, wrote "Cindy…had lots of practical and teaching methods in it so they could see how to perform a movement, and then got to try it (even imagining it if it was too difficult, aka imagery)" (Le Long, 2014, p. 3).

One of the main areas participants had difficulty with was that of sensory awareness; it required practice. As Participant 5 put it:

> I probably found that one of the more difficult parts …difficult to be aware of what body part you were focusing on, you can't feel them like visualising the movement… It's one thing you need to practise more and more.

Many of the challenges participants experienced could be addressed throughout the programme by making minor changes to lessons. For example, Week 2 involved an ATM lesson on lateral flexion. I worked individually with clients getting them to feel how opening the ribs on one side allowed them to lengthen the leg and press the foot against my hand. This seemed to be effective for some of the participants and we progressed to having them press their feet against the wall. However they were unable to feel this so I decided to remove this step from the lesson.

At times, I needed to demonstrate movements. For example, Week 8 included an ATM lesson on extension whereby lifting the head while lying prone becomes easier. As part of this lesson, participants lay prone and imagined that they were pressing and lifting the knee. They were required to imagine the groin pressing into the floor as they imagined lifting the corresponding knee and then imagine the groin lifting as the corresponding knee presses into the floor. Initially after this step there was no change to their ability to lift the head. They had difficulty imagining the movement which involved differentiating the pelvis from the thigh, rather than moving them all as one. As Participant 5 said “It’s hard to imagine pushing something and the same side lifting” “I can sort of imagine pushing something down, but I can’t imagine the lifting”.

I demonstrated the movement and they tried again. Having seen me do the movement they found it is easier to visualise. Participant 2 said that, before seeing me demonstrate, she

would have tried to lift her whole body to press the right knee. Once again I got them to lift their heads and they found that it had become easier.

They had particular difficulty with differentiating at the hip joint. This is not surprising given that they spend most of their day in wheelchairs so that their hip joints are rarely opened. Difficulties in opening the hip joint seem to be a significant contributor to spasticity. Spasticity seemed to increase when they lay on their backs (when the hips were extended). Participant 5 told me that he has to sleep with his legs bent or he gets spasms. If he tries to force the legs to straighten, he gets nerve pain. In Week 3 he was having a lot of trouble with spasm on his right hip as he lay on his back. This was relieved by lying on his side. Prior to Week 3, I had been getting them to lie on their backs during the rest periods on the back but in Week 4 I recommended that they rest on their side if that was more comfortable. They all chose to rest on their side which provided relief.

In Week 8 I realised that the strategy they were using to go from sitting to lying on their backs was causing much spasticity. They had a tendency to lean straight backwards from sitting, causing the hip joints to be forced open which lead to spasm. I encouraged them to go from sitting, to side sitting, to side lying and to roll onto their backs from there. Lengthening legs while rolling would enable their flexors to open slowly. They found that using this strategy was easier and caused less spasm. They felt that the new strategy was “really gentle” and “smoother” (Participant 3, Participant 5, Week 9).

Another skill participants had particular challenge with was rotation of the trunk. Week 5 included an ATM lesson on rotation which participants found “challenging” (Participant 2) and “difficult” (Participant 5). Despite their difficulties, their ability to rotate improved during the lesson. For example, after the ATM Participant 3 commented “It’s comfortable. There’s no

tightness…It's easier." Participant 5 found that he was "Using the hips and everything a bit more…I can feel more rotation in the hips and spine" (Participant 5, Week 5). I could also see that one shoulder was going back now as he rotated whereas previously it didn't.

The difficulties they experienced with rotation were also clear in Week 12. This was the last lesson and I had deliberately made it challenging so that they could explore ways of dealing with the challenge. This lesson involving rolling from crossed legs to crossed arms which required rotation of the torso. They were aware of the difficulties they were having with rotation and were able to recognise that they were adopting strategies to avoid it. Despite the difficulties, they seemed to enjoy the challenge of this lesson and, as Participant 2 pointed out, "It's quite good to be reminded of what you can't do".

One really significant issue was that of getting on and off the floor which was difficult and painful for them, particularly getting back into the chair. At first I was reluctant to show them another strategy. As I have full use of my legs, I wasn't really confident that I could "get into their bodies" or challenge the strategies that they had been taught by the physiotherapists decades ago. However in Week 9 I explored a strategy for getting on and off the floor using a kitchen chair. I showed them how to move in a spiralling trajectory to go from sitting in a chair, to side sitting, to side lying and then lying on the back using the seat of the chair for support. Spiralling is generally easier and gentler on the joints. They won't always be in a situation where they have an extra chair but it's a strategy that they could use when a chair or similar height object is available.

They each tried the strategy once; I didn't want them to do it more than once as it would be too tiring for them. One of the difficulties they had with the new strategy was that their legs tended to get tangled up so they watched each other doing the movement and refined my strategy

to work out a strategy that worked for them. Four out of the four that attended that particular class were surprised at how much easier it was using the strategy to get onto the floor. They noticed that it didn't strain the shoulder joints or provoke spasm to the same extent as the previous strategy. Three out of the four found that getting back into the chair was easier with the new strategy. As Participant 5 commented “I was quite surprised how easy it was on my shoulders. The fourth was unable to achieve the movement with the new strategy.

Despite the difficulties in getting to the floor, they still found lying on the floor valuable evidenced by comments such as “It’s good to actually get out and stretch out on the floor” (Participant 5, Week 8) and “I can achieve a lot more on the floor in terms of isolating muscles and relaxing because I don’t have any balance in my chair” (Participant 4, Week 4).

I discussed the issue of comfort in Week 2 but enlarged on its importance in Week 4 as I felt that I needed to spend longer exploring comfort and the use of supports to reduce pain and spasticity. Throughout the programme I checked that participants were comfortable and the movements were pleasant by asking “Is it pleasant?” or “Is it comfortable?” Participants generally responded with “yeah” or “yeah it is”. Occasionally participants reported pain with the movements but generally this could be resolved by adjusting their supports. For example, Week 9 included an ATM lesson on rolling from the left side to the front. As part of this lesson they had to lie on the left side with the head on the left arm. Participants 3 and 5 reported that having the arm extended was painful. However, I recommended they put supports under the armpits and they found that the supports relieved the pain.

Another way discomfort could be reduced was by getting them to do the lesson from a different position. Participants 1 and 2 had difficulty with leaning back on their hands when sitting on the floor. Week 10 involved a lesson on extension and flexion and for much of the

lesson they had to lean back on their hands. Two of the participants had difficulty with this. As Participant 1 commented “I don't enjoy the sitting up stuff as much just because it’s harder for me - it doesn't feel as good cos you've gotta hold myself up a bit more and its quite stressful”. I got them to do the movements from the lying position which made it possible for them to do the lesson.

For Participant 2, pain couldn't be avoided and she tolerated small amounts of pain while doing the movements “I don't mind a little bit of pain. I know you're not meant to but pains kind of there anyway”. However she found that **Feldenkrais** was easier than other modalities she had tried “This [Feldenkrais] is gentle, that's a good thing”. Spasticity was more difficult to manage although it could be mediated somewhat by the use of supports and by encouraging participants to allow their hip joints to open slowly.

For Participant 1 doing lessons in the chair caused nausea. In Week 7 we did the first chair lesson and she had to leave early because she was suffering from nausea. In the second chair lesson she was absent. Moving around in the upright position was difficult for her. She suggested that I advise them in advance if I was going to include sitting lessons as, if she had been aware, she would have taken her nausea medication prior to the lesson.

Attendance.

For the three participants who had initially wanted to do the programme during the day, attendance was less than 80% (7-9 weeks). Reasons included illness and injury, family commitments (such as childcare and a mother visiting from out of town), a three week holiday, and moving house. Two were moving house at the time of the programme, which was common as at the time Christchurch was going through earthquake repairs. It was particularly complicated for people who used wheelchairs as, amongst other difficulties, there was a shortage of

accommodation. The two participants who had wanted to do the programme during the evening (one of whom travelled a two-hour return trip to get to class) had a perfect and near-perfect (one sick day) attendance record. Participants always let me know by text if they weren't able to attend.

Participants mentioned that the issue of mobility made it hard work to get to and from class. In Week 10, Participant 1 commented:

> For some reason people with spinal cord injury are bloody useless at getting together or doing stuff. I don't know whether it's because we spend so much time doing little stuff like going to the car, getting into the car. We just don't have the energy to do other stuff.

This was further explained by Participant 3 "Everything takes longer than normal when you're in a chair…So much time is taken up just getting organised" (Week 10).

Lesson length.

Jorden, the student volunteer, and I initially perceived the lessons to be too long. The ATMs were about an hour long and in Week 1 the class finished at 8.30 making the whole class two hours long. Jorden commented to me that the ATM was perhaps 20 minutes too long and wrote in his report:

> Perhaps the sessions could have been 30 minutes shorter with a higher intensity or had 2 1 hour sessions a week instead. This would have allowed time for the group to process the information, which may have led to a greater improvement in their movement etc. Although this would have been ideal, the group had busy lives outside of the Feldenkrais Programme, and it is a struggle for wheel-chair bound people to get from place to place (e.g., getting in and out of their chairs multiple times to drive there and get on the floor

for 1 hour only so I understand the reasoning of the time and days for it (Le Long, 2014, p. 4).

However the participants' experiences differed and they commented on how "The time flies by" (Participant 4) and "I didn't find the sessions too long or anything like that" (Participant 5).

Homework.

At the end of Lesson One, I gave them all mats and rollers to take home to practise if they chose. I also gave them at least one homework ATM (about 45 minutes long) at the end of each class. The majority of the homework ATMs were audio lessons on CD. However I also included some of Alan Questel's *Pregnant Pauses* DVDs (Questel, 2010). On these DVDs he demonstrates the key movements in the lessons and viewers get to see women performing the movements. I stressed that doing homework was optional and that there was no point in them doing it they were tired. As Jorden, the student volunteer, wrote in his report:

> Cindy was very detailed with her work, giving the group optional homework to do and DVDs they could try at home, and lending equipment (i.e., rollers and mats) to them. This meant that the teaching was reinforced which is important in Feldenkrais as it takes time and effort to train your body to move differently than what it has been doing regularly (Le Long, 2014, p. 3).

They all opted to take the materials home, Participant 2 tried all the homework CDs and Participant 3 attempted some of them. However overall there was very little uptake of the

homework CDs even though they felt that doing homework would be valuable for reinforcing their learning. For example, Participant 1 said:

> I do find it a little bit frustrating that you feel the changes and I get really excited...but it does go really quickly and I know I don't do the homework and I don't repetitively do it and I should, it would be good if I did but there is a sense of disappointment when it does go (Week 6).

For one participant an obstacle was that he did not have a CD player on his new computer. Another obstacle was finding time. Comments included "For me I probably found it difficult to put time aside to do it…I can't really do it till everyone's asleep" (Participant 5). For some there were too many other things going on (such as moving house[2]) and doing the homework was not a high priority "I'm waiting for the aches and pains to really kick to a point where it does impact on my life and then when that happens then I'm going to be right I have to do something" (Participant 1).

Participants were also put off doing the homework because it required getting on and off the floor. As one participant put it "I don't like getting down on the floor…I don't mind getting onto the floor; I don't like getting back into my chair...I shy away from that, there's a lot of work to get back into the chair" (Participant 5). However despite the difficulties with getting onto the floor, Participant 2 commented "it's definitely a benefit getting down onto the floor… If you've got enough time it's good to just gradually relax out". She found that she resisted getting onto the floor because she felt rigid and in pain, but by the time it was finished she was feeling a lot

[2] Two participants were moving house at the time of the programme

better: “I breathe in little short gasps when I’m starting out, but by the time I’m finished, it’s clearly different because I’m breathing normally. It’s quite relaxing.”

Another issue was space:

> We've only got a little house. The living room space is also the main thoroughfare and by the time everybody's got out and I've got to put the mats down it's a mental stop for me so I might just try it on my bed” (Participant 3).

Given that space, time, getting onto the floor and body awareness seemed to be issues for all of them, in Week 9 I gave them a shorter homework of doing a body scan which they could do on their beds. They seemed to like this.

Given that there had been so little practice of the CDs and that I wanted to assess their suitability for the next phase, I gave them the option of holding onto the CDs for another two months. They all opted to hold onto them. However, when I contacted them several months later, only Participant 2 had got round to practising the lessons on the CDs.

One insight into what may have prevented people from doing homework ATMs came out of the discussion I had with Participant 3 some months after the programme. He commented that his avoiding homework was not specific to **Feldenkrais**. At the time he was doing a programme with his physiotherapist. As part of the programme he was required to do some stretches that only took a few minutes yet he still didn't get round to doing them - there was a resistance. He and I suspected that this may have come about because, in order to do the exercises, he needed to transition from one state to another, i.e. slow down. Often when we are in a state of busyness (“doing”) it can be difficult to transition into a state where we are paying attention to ourselves

("being"). I personally find that it is a daily discipline for me to change from the busyness of my day to the focus I need to do ATMs.

In Week 10, Participant 2 commented that having come to class made the homework CDs easier to understand. If she hadn't attended the programme she didn't think she would have been able to do them. After being recruited for the programme and before attending, she had listened to some lessons online and they made no sense to her. As she said "The CDs are good but I think it's because we've heard you go through it as well".

She always enjoyed the CDs, though she sometimes found them a bit of a workout. She found that the rest times weren't long enough and that the lessons didn't allow enough time for her to change positions. For example she found Alan Questel's "*Easy Rolling*" ATM good but there wasn't much time for her to get on and off her back. She found Alan Questel's *Pregnant Pauses* DVDs useful as it was good to be able to check positions and see how other people were doing the movements.

She found a couple of the *Pregnant Pauses* lessons particularly helpful. For example she had a light bulb moment with the "*Pressing and Lifting*" ATM in Week 2. This involved pressing and lifting the ribs from the floor and she discovered how the movement of the pelvis helped her move her ribs. She felt she was becoming more symmetrical which was important for her as she has a significant scoliosis. She also found that the pain that she had before the homework had gone by the end of the homework. She slept well and got out of bed more easily the next morning

After doing Questel's "*Gentle fingers and gentle threads*" she went to get the DVD out of player and found that she "was bending much better." "I could balance myself and bend…I went

to take the DVD out of the player and normally that's quite a mission. I get the chair to get down, but I actually could bend down to do it."

Despite the general poor uptake of the homework, they spontaneously practised things they had learned in class. For example, in Week 8 Participant 5 commented on how he had practised the movements from the chair lesson in Week 7. He had enjoyed the lesson:

> because I get a lot of pain down this left side and into my hips and I felt like that session last week really stretched that out from the side to side. Yeah I felt way better so I've been doing a bit more of trying to get the posture rolling on the bones of my bottom again.

2. What was the nature of the learning environment?

The answers to this question were divided into four themes:

- Engagement;
- Group interaction;
- Teacher interaction; and
- Materials.

The environment was friendly and positive - participants were engaged, motivated and supportive of each other and found the lessons enjoyable and relaxing. Throughout the programme I gave assistance to participants when they needed it and ensured that they were comfortable. Participants were happy with the mats, cushions and pads which were comfortable and easy to use.

Engagement.

Participants appeared motivated and attentive and seemed to enjoy the programme. They nodded frequently, made relevant comments, and asked relevant questions. I also observed them exploring movement in their seats as we were discussing them. For example, in Week 9, while I

was discussing how muscular holding in the leg can hinder movement throughout the skeleton, Participant 2 was experimenting with holding the legs still whilst moving.

They also illustrated an enthusiasm and willingness to try new things. For example, in Week 9 we explored a new strategy for getting on and off the floor. They were all keen to try the new strategy even though getting on and off the floor was an activity they found unpleasant. Participant 1 seemed less sure of her ability to use the new strategy, however when I asked if she really wanted to try it she stated "I totally do". As Jorden, the student volunteer, wrote in his report "The selected participants were motivated people…They regularly attended sessions, and were not afraid to ask Cindy questions if they wanted to know something or were unsure what or how to do an exercise" (Le Long, 2014, p. 3).

They also reported enjoying the classes giving general comments about the lessons such as "I've enjoyed it" (Participant 5, Week 9) and comments about specific lessons that they found enjoyable such as "I like doing this", "It's so much fun" (Participant 1, Week 9) "I'm kinda enjoying it" (Participant 4, Week 12), "That's quite fun" (Participant 2, Week 12) "I really enjoyed last week" (Participant 5, Week 9) and "Rolling is cool" (Participant 1, Week 12).

Participants also reported on how relaxing the lessons were. For example, in Week 1, Participant 1 said, "It's quite nice also to be forced to stop…You sit there and suddenly realise your tongues like aargh and your eyes are scrunched up" (Participant 1, Week 1).

Even though they didn't like getting onto the floor, a couple of them found lying on the floor pleasant once they got there. Comments included: "I actually liked lying out flat and I should do that at the end of every day" (Participant 2, Week 1). "I struggle with getting here and the time and stuff...but when I'm here and down on the mat it does feel nice" (Participant 1, Week 6).

Group interaction.

Three members of the group knew each other; two members of the group were complete strangers. They interacted in a way that was positive and supportive of each other. From Week 1, they began chatting amongst themselves on topics such as sport, moving house, their work and social life. They laughed frequently and injected humour into the programme ("You tend to lose your pants manoeuvring in and out of the wheelchair" (Participant 5, Week 2)).

The supportive nature of the group became particularly evident in Week 9 when I asked them to explore a new way of getting onto the floor and back into the chair. I asked them to do this one at a time so that they could observe each other's strategies and learn from them. This was the first time in the programme that they had been required to observe each other. Comments included helpful suggestions: *"*Did she have a hand behind her?" (Participant 5, Week 9), "Turn the chair right around" (Participant 3 to Participant 5, Week 9), "Right hand goes on the chair that you're sitting on", "Is your hand too high?" and general support for each other: "It is hard to get your head around" (Participant 5 to Participant 2), "You go to whichever mat is easiest" (Participant 2 to Participant 1, Week 9), "That did look very smooth actually" (Participant 5, Week 9) and "Did that feel easier? It looked quite graceful" (Participant 5 to Participant 2).

From Week 1 they also began sharing experiences in relation to their disability such as their functioning (Participant 2, Participant 1, Week 1) and their preferred wheelchairs. Participant 2 pointed out that she appreciated being in a programme where you are with a group of other disabled people as there are not a lot of group activities available for disabled people: "I only ever see Pilates and yoga, everything just for normal people. I've been to different classes and they haven't really wanted me there… You don't want to go along and be the odd one out".

Teacher interaction.

The theme of "teacher interaction" addressed the issue of whether or not I was interacting with participants in a helpful way. Overall the learning environment seemed positive. As Jorden wrote in his report:

> Cindy created a positive learning environment with interaction between the group…"When teachers feel that they have created classroom environments that positively engage students and optimize their learning, teachers' self-efficacy soars and their classroom has "it." Teachers can take certain steps to create those "friendly" environments in which they and their students can thrive" (Pickett & Fraser, 2010). (Le Long, 2014, p. 3)

Throughout the programme I frequently gave assistance to participants. This had been part of my intention when I chose to work with such a small ATM class. During each lesson I checked with participants to ensure that they were comfortable and able to follow the instructions. I gave them hands on assistance with some of the movements such as pushing the roller. I also instructed the volunteers on how to assist them with simpler tasks such as helping participants to hold their legs on the roller or bringing them supports. This help was appreciated, although, at least one participant would have appreciated more and commented:

> I'd like some more hands on stuff like when you came up before and you were sort of saying 'can you feel that' and you were showing me the crunching of the tummy or whatever, that was quite helpful; it was sort of more, I was sort of drawn more to it. It's easier to sort of sense it when you're there (Participant 1, Week 6).

She also felt that she could learn from watching others commenting “When you were working with Participant 3 you did something: you kind of helped him and just seeing the way you did that on him was quite helpful” (Participant 1, Week 6). Participant 2 felt that my personal experience gave me a real understanding of how it was to be in their bodies and she appreciated getting individual attention from someone who understands what you need.

At times the participants were confused which seem to stem from the lack of clarity of my instructions. As Jorden, the student volunteer, wrote:

> Although I felt it was a successful programme, it was the first time Cindy had run a group course like this so every lesson had a bit of trial and error involved with it. Some areas which could have been better was the description and explanation of some of the exercises. (Le Long, 2014, p. 4)

The lack of clarity stemmed, in part, from the complexity of the lessons. At times I asked them to attend to too many parts of an action at once. For example, they had difficulty in Week 1 where the ATM predominantly involved rolling back and forward with one leg on a roller. I introduced a step where they were encouraged to pay attention to the flexion and extension of their spine as they rolled back and forward and then to track the distance between the shoulder and hip as they rolled. This became challenging evidenced by the degree of confusion and effort participants experienced. At this point they began asking a whole series of questions such as “So I'm still heading towards the ceiling?” (Participant 4, Week 1), “Have we still got our hands over our heads? (Participant 1, Week 1) and making comments such as “It was a fair bit more effort with the arching of the spine” (Participant 4, Week 1). Participant 2 was slow to begin this movement and reported feeling uncoordinated. Participant 3, who up until that point had

managed to keep his leg on the roller, found that his leg started falling off again. As Jorden, the student volunteer, wrote in his report:

> There was a lot of exercises each lesson and as it was the groups' first time performing Feldenkrais, all the information was new and there may have been too many instructions and/or information to process at once. This meant at times there was confusion among individuals, with some doing the movements incorrectly, or Cindy having to explain multiple times (wasted teaching time), to get the point across. “One of the easiest mistakes to make is to introduce too many variables” (Rivers, 2013) (Le Long, 2014).

The lack of clarity may also have stemmed in part from my fatigue. I found running the programme very tiring for a number of reasons. I was running the course “live” for the first time in the evening, trying to attend to the movements and feedback of five disabled people whilst making amendments at the same time. I found that running an ATM class with people with SCI required much more individual attention than running a class with able-bodied people. Twelve weeks felt like a long haul and by Week 6 I felt that I needed a break.

Materials.

Generally there was very little comment on the materials which suggested that they were not causing discomfort. However, as I wanted to evaluate the usefulness of the materials, in Week 2 I asked them how they found the mats. They said that the mats were great - comfortable and yet easy to move on which is a big issue if you have an SCI. One commented that they were good enough to sleep on. Another commented “I quite like the mat. Apart from being on the ground, they're a lot similar to lying on the plinth in the physio gyms” (Participant 4). Having a

fan heater was also useful as Participant 1 in particular felt the cold more than others so I was able to direct the heat onto her.

Having cushions and pads in a variety of sizes was of value. As Participant 2 said “these cushions are good. It's good having an option of sizes”. One of the ways in which I used the materials was to place large cushions under parts of the body to assist with the preparation for movement. Participants found that this facilitated their learning of the movement. For example, in Week 12 I placed a cushion under one side of Participant 4's pelvis so that his pelvis was lifted slightly enabling him more easily to roll towards his side and then his front. He found that this “definitely” helped.

3. How appropriate was the content for this group?

The answers to this question were divided into three themes:

- Comprehension;
- Practical application; and
- Programme value.

Participants understood the lessons and at times their experiences on the programme challenged their preconceptions, e.g., what could be achieved without forcing and stretching and the effectiveness of visualisation. They found the lessons relevant to everyday functioning and the reduction of stress and pain. They valued paying attention to the neglected parts of the body. Attitudes to the programme were positive with participants describing it as “really good”, “awesome” and as definitely having “real relevance”. They were motivated to continue with the **Feldenkrais Method** at the completion of the programme and felt that **Feldenkrais** should be used in rehabilitation immediately after an SCI.

Comprehension.

"Comprehension" addressed the issue of whether or not the participants were able to understand the theoretical content and whether their practical experience matched the theories I was teaching them. Throughout the programme I checked to see whether or not the participants understood the material. I would frequently ask the question "does that make sense?" at which time participants would reply with responses such as "yes", "yeah" or "it's good", nod or seek clarification. Evidence of their comprehension was also provided by the questions and answers provided by the participants. The questions that participants asked and the responses they gave to my questions were relevant to the topic at hand. For example, in the sitting lesson in Week 7 I asked them what stops them from reaching further. Participants 2 and 5 replied "your balance".

I found at times that I needed to shift from my original plan to focus on questions brought up by the participants. However the questions were always relevant to the programme. For example, in Week 4 their questions developed into a long discussion on stretching, even though that was not in my original plan at that stage.

Throughout the ATMs I also asked them questions to see whether or not their experience was consistent with **Feldenkrais** theory. For example, in Week 1 I taught them about how engaging the torso in movement influences the quality of movement. During the ATM I asked them to notice the difference between moving the arm from the torso and moving the arm from the shoulder blade. Participants observed a big difference finding that moving from the arm only was "kind of wooden" and "quite jittery instead of one smooth motion".

In addition to the practical experience provided by the ATMs, I gave participants short exercises that also gave them the opportunity to experience the theory in practice. For example, in Week 1 I got them all to look left and notice how far they moved. Following this, I explained

how bringing our attention to the background movement influences our movement. We might think that looking to the left involves only the head, neck and eyes but there are many movements that occur in the background such as movement of the torso. After this explanation I got them to look left again and they all looked further, using more of themselves. As Participant 4 said “I guess it's like you said, it's just that awareness” (Week 1).

At times what I was teaching them challenged their existing preconceptions. For example, the participants repeatedly expressed surprise at how much they were able to increase their range of movement without using effort or stretching. It was “quite hard to get my head around. I'm so used to stretching as much as possible, stretching till it hurts kind of thing. It was a different concept” (Participant 4).

> I was initially surprised by how little you needed to do to get the benefits. But I think that was something that initially took me a wee while to get my head around…By the end of each session I could see how it actually worked. I could see the benefits in better rotation or better movement (Participant 5).

Increasing range without stretching went counter to what they had previously been taught.

> It’s hard to get your head around because we’ve had 20 odd years or so of physios saying to us ‘you gotta stretch, you gotta stretch. It’s the only way to get the muscles to stretch out…“I’ve seen it happen and I do find it amazing but it’s still hard to get my head around the fact that I still think ‘I’ve gotta stretch, I’ve gotta stretch’ even though I know everything you’ve told me and I’ve seen it work (Participant 1,Week 4).

By Week 5 they were starting to see how this worked: “You move just little bits, little bits and little bits rather than trying to stretch right out” (Participant 2), “You slowly get to that point where you’ve actually moved further…it’s just slower movements but it gets bigger and a wider range of movement with Feldenkrais” (Participant 5).

However by Week 7 it still came as a surprise:

> I'm kind of thinking ‘well I'd really like to know how I can apply this to real-life’ and then we did the reaching out at the end and it was like wow because that's something I'm very poor at is reaching out for things without bracing or holding myself up and to feel myself my counterbalancing improving and my range extending, not greatly, but definitely noticeably, that was great” (Participant 4, Week 7).

Another strategy that challenged their preconceptions was that of supporting the muscles in a shortened position in order to lengthen them. In Week 4 I showed them how putting a roller under a bent knee allowed the muscles to relax and lengthen. This is in contrast to traditional approaches where efforts are made to lengthen the muscles through either gentle or strong force. Some participants couldn't really feel the effect; others found this helpful. For example Participant 2 commented “I feel immediate relaxation as soon as that bolster goes under there.” When she removed the roller she found that leg had become straighter. She commented “It’s a much kinder way to relax than have a physiotherapist twist my legs and stretch my hamstrings which is giving me a lot of pain in my back.”

This went counter to what they had been taught:

> It's awfully frustrating when you know that the majority of the way we do everything is through physiotherapy and is all about forcing and stretching. That's kind of so ingrained and yet with my right leg it's been really tight and I was trying to force it like earlier this year to get it open cause that's what the physios were telling me. But I think I get more benefit from what we do (Participant 1, Week 4).

Another example of the preconceptions being challenged occurred in Week 1. I wanted them to experience what happens when we try to adopt "good posture" (where movement can be inhibited by efforts to stay upright) rather than move from a position of comfort. I got them to look up and then look left. After that I got them to adopt what they considered "good posture" and look up, then left. They found that with "good posture" they had "much less range". As Participant 4 said "To start with it was a bit of a mental hurdle for me because I kind of associate good posture with health and vitality" and yet "I tend to do kind of what you're sort of suggesting because it's difficult for me to have good posture". He found that when he was comfortable he was in a more functional position: "If I have good posture, my functionality is very low…I'm much more productive if I'm slightly slack".

Participants were also surprised at the effectiveness of visualisation. It was difficult to understand that visualisation could be effective in areas where they didn't have movement. As Participant 5 said *"*I probably found it difficult to understand sometimes when you didn't have the trunk function you know the visualisation or being aware of the body but I understand that's part of the concept". Again reservations stemmed from what they had been taught: "It's tricky when they tell you from day one 'it's a physical thing, you've got what you've got, any kind of

thinking is completely irrelevant because it's just a physical thing'" (Participant 1), "You've lost that connection so don't bother" (Participant 4).

However they felt that visualisation was "so important" (Participant 1) and "a good thing" (Participant 5). In Week 3, Participant 4, who was diagnosed with complete tetraplegia, described how using visualisation helped him to connect to his abdomen:

> At a stage when we were holding below our belly button and like I sort of can't feel there but I was connecting to the visualisations that I had for the diaphragm and so when I exhaled and the diaphragm came up that was kind of pulling my stomach in as well.

Practical application.

"Practical application" addressed the issue of whether or not the lessons have practical applications to the everyday lives. Throughout the programme I told stories of my own experience and gave examples of people with SCI who had used **Feldenkrais**. Participants also frequently mentioned ways in which they felt the classes were relevant to their lives and gave examples of how they were using what they'd learnt. Sometimes this came as a result of my prompting. At other times comments were spontaneous. For example, in Week 10 Participant 1 said "I like how you're incorporating it into real life".

From Week 1 participants started seeing the relevance of what they were learning to everyday function. For example, in Week 1 Participant 4 talked about how learning to turn with less effort helped him with putting his wheelchair in his car:

> It makes me think about some of the movements that I am using day-to-day, putting my chair on my car for example where I do have to literally twist my body around and it makes me think that I have been doing it a little bit hard as I'm not using that sort of

mobility that's in my ah at the moment and so I'm looking forward to incorporating that a bit.

Some of the lessons which participants pointed out as being particularly useful included the breathing lessons, rolling onto the back, rolling to sitting, rotation, extension and the chair lessons. For example, in Week 3, they seemed particularly impressed with how learning to use the breath effectively could influence their function. “It is amazing how much extra you can get when you are exhaling…You try and do it the other way and you tighten up straightaway” (Participant 5). “Even the breathing on its own I can use in so many situations…I realise how when I'm doing my shoelaces up, I cut my breathing off” (Participant 2).

> That's one of the things I'm enjoying about this is the breathing and expanding the ribs and stuff…With the breathing and the ribs I've noticed benefits just by concentrating on the ribs expanding and closing but I've been belly breathing for the last 22 years so my ribs have got quite small and quite contracted so I'm thinking “wow, I would have liked to have been encouraged to do something similar a long time ago” (Participant 4).

At times participants reported that they were using new strategies that they had learnt on the programme in everyday life. For example, in Week 10 Participant 3 commented:

> There are aspects of what we're doing that I try to bring into my everyday as well like rolling over I make sure that I bring my legs up the way we do on the mat up to 90° and careful how I roll over. Turning I make sure I do that [turning the whole torso] rather than that [turning the neck only]”.

Rolling to the back as they learnt in class had become his preferred strategy for getting onto his back when getting into bed “I always adopt this way. I wasn't just showing off, that's what I do now”.

Participants also saw the relevance of paying attention to themselves for stress management:

> The breathing and the first stuff we do [a body scan at the beginning of the ATM]... the relaxing and relax my eyeballs and relaxing my mouth, I find I do that more than anything else like if I'm at work I notice that my eyes are all scrunched up and I just try and sort of soften them and I find that helps quite a lot (Participant 1, Week 6).

They observed that learning to use more of their bodies in movement could potentially prevent pain (“I can see the benefits in preventing myself hurting myself” (Participant 4, Week 12)) and noticed a reduction in strain after some of the lessons:

> I think that's what I noticed to start with is doing any of the movements you were suggesting [reference movements] I was actually putting a lot of strain through the back of my shoulders. As the session got on the strain reduced a lot and I was doing more movement, so it’s like you're saying there's less effort involved and there's more movement coming along with it (Participant 4, Week 2).

For Participant 3 there was a progression from his seeing the potential to actually experiencing some relief from pain. In Week 1 he observed “I guess it's going to hopefully make me and I guess that's the aim of it to make me more conscious of how I'm turning and not just sort of use my shoulder to turn my whole body”. After the side bending lesson in Week 2 he

noticed that his shoulder did not have to work so hard. He felt that the lesson could probably help with “reducing the amount of effort in shoulder and back muscles. You tend to strain that a lot rather than stretching though the ribs”. On the morning of Week 4 he did one of the homework ATMs and it caused his shoulder pain to go away. His shoulders felt much more comfortable and relaxed during the day.

Programme value.

Participants described the programme as “really good” (Participant 5) (Participant 2), “awesome” (Participant 1) and as definitely having “real relevance” (Participant 4). This was supported by the student volunteers and Jorden, one of the volunteers, wrote “Overall, I thought the Feldenkrais programme that Cindy ran was excellent” (Le Long, 2014, p. 3).

One of the features that participants described as being valuable was paying attention to those parts of the body that they had neglected.

> One of the key things for me is that I rarely if ever stop and think about a part of me unless there pain and so this is really good for just dealing with bits of you, piece by piece (Participant 2).

> I think for me it's been kind of engaging with my body again. I guess I have such loathing towards it because it’s so munted and broken that I just sort of push it away and don't want to think about it. Doing these exercises you kind of confront it and you do feel good after a lot of them and you kind of feel kind of invigorated and you think I should really be focusing a lot more on my poor little body that I've battered (Participant 1).

> Like [Participant 1]'s saying, you suppress a lot of that. It's like 'no I don't need you anymore; you're no bloody good to me. It's too much effort to try and use ya' and they just get weaker and weaker (Participant 4).

In Weeks 2 and 3 Participant 4 expressed his regret at not having been introduced to **Feldenkrais** earlier "crikey why didn't I do this a looong time ago and what would I have achieved if I did it when all those muscles were sort of much younger and sort of more available". Despite his complete diagnosis:

> Even after 22 years if I think about it enough it does kind of feel like there's some sort of connection going on. I know there's very very low likelihood that it will but it just makes me think that crikey if I'd done that 22 years ago when there was probably a lot more chance of something happening.

They felt that it would be really useful to get patients onto the programme soon after their initial injury. Comments included: *"*Definitely in the short term you'd see better results in people that haven't been in a chair for that long" (Participant 4) and

> You really need to get in here [Burwood Spinal Unit] and try and get early patients and get them into good movement habits straight right from the word go…get people early and get that visualisation and body awareness and movement…it could really be a good thing (Participant 5).

Participants said that they would like to continue practice after the course. As Participant 2 said "Ultimately I'd like to think I can keep doing this…At the moment I feel better for it".

Participants felt that the best way to keep them practising was to have ongoing classes and Participant 3 suggested that I set up lessons via Skype so that people could avoid the hassles of getting to and from class.

It appeared that they didn't yet have the tools or motivation to continue practice without classes. Several months after the programme I met with participants to pick up the mats, rollers and CDs that they had borrowed. Four of the participants told me they had not practised the lessons over the last few months. One participant returned the CDs with a thank you card on which she wrote "I enjoyed learning about Feldenkrais. I'm in need of motivation as I haven't been able to maintain it. I have the thought that one day I'll be able to dedicate lots of time to myself. Having a regime that includes exercises and Feldenkrais is the goal." They reiterated that in order to continue practice they needed exercises that they could incorporate into their everyday life or short lessons they could do on their beds.

However participants were still using some of the principles that I taught them so they felt that the course was definitely worthwhile. For example, one of them was finding it was still easier to put his wheelchair in and out of the car because he was rotating his torso more than he did prior to the course.

4. What were the preliminary effects of the programme?

The answers to this question were divided into four themes:

- Participant expectations;
- Sensory motor learning;
- Cognitive learning and reflection; and
- Sustaining change.

Participants had low expectations of the programme but hoped to find a way of slowing down the loss of flexibility and stability and increase in pain and spasticity due to ageing. They reported sensory motor changes after the ATMs including improved postural control/balance, improved ease of movement, improved body awareness and movement strategies and increased relaxation. Generally these sensory motor changes were not sustained; participants felt they needed more frequent and ongoing lessons to sustain changes. However they reported increased skills and confidence in movement exploration and strategies and were still using the principles learned in the programme months after programme completion. There were no reports of any negative consequences from the lessons.

Participant expectations.

Participants hoped to find a way of slowing down the loss of flexibility and stability and increase in pain and spasticity due to ageing. Of the four that had had no exposure to **Feldenkrais**, three of them expressed having low expectations. For example, Participant 2 stated, "I have low expectations of improvement but I would really like to think that the next five years was stable not like the last five." Participant 4 commented that no recovery was possible for him because he had a complete injury. Participant 5 didn't think he would be able to manage the programme as he had bad spasticity and he had been unsuccessful when he had tried other options such as yoga or stretching as stretching tended to increase his spasticity and the yoga teacher had been unable to modify to meet his needs. I informed him that there would be no stretching involved in the programme.

Sensory motor learning.

"Sensory motor learning" encompassed changes in movement or sensation that participants experienced as a result of the lessons. One of the ways in which this was assessed

was by the use of a “reference movement” at the beginning and end of each ATM. The reference movements included simple movements that were part of everyday function, e.g. reaching to the left. These enabled participants to observe what had changed in the lesson.

All participants noticed benefits from either some or all of the lessons. There were no reports of any negative consequences from the lessons. As Jorden, the student volunteer, stated in this report:

> The four sessions I had observed had shown me that individuals either found that they had improved movement after performing the exercises, or felt that it had little impact on them. There was never any negative feedback towards the movements as Cindy explained the reasoning behind each one and how to do them thoroughly…at different stages the individuals could feel an improvement from doing the movements, so they were happy and satisfied (Le Long, 2014, p. 2).

The main areas in which participants noticed changes were improved ease and range of movement, improved body awareness, new movement strategies, improved balance, increased relaxation and decreased pain. Participants commented frequently on how their movement became easier. Sometimes this was due to general improved body use leading to comments such as “it's easier” (Participant 3, Week 10), “it feels like it’s just kind of a lot more elastic” (Participant 1, Week 2), “whoa, it’s way better” (Participant 4, Week 4) and “there’s like a whole lot of lift all the way down the back” (Participant 1, Week 4).

At other times the improvement was as a result of an explicit change in strategy such as when they learnt to roll from the back to the side and back again. This led to comments such as

“I’ve got a new way of turning to my side. Woo hoo!” (Participant 1, Week 4) and “It’s less brutal” (Participant 1, Week 8).

Another example of a change in strategy was in Week 9 when they learned a new way of getting on to the floor. This led to comments such as “It was actually less effort on my shoulders I'm actually blown away by that that because…didn't feel I had much strain going through my shoulders at all” (Participant 5).

From Week 1 participants also observed increased range of movement with comments such as “yeah I think I can go further” (Participant 2), “I feel like I'm going further” (Participant 1) and “I seem to have a lot more range” (Participant 4). These observations were supported by Jorden, the student volunteer, who commented “it looks like you're going further”. At the end of the first class, Jorden commented on how interesting it was to watch their range of movement increase. They continued to experience improved range throughout the programme with comments such as *“*It’s probably twice the distance” (Participant 2) and “I’ve definitely got more range” (Participant 5). Jorden commented on the decreased effort and increased range of movement in his report:

> An example was session 2 where participants practiced using their torso and ribs to increase their flexibility. As the majority of the group are in wheelchairs, they depend on their upper body a lot (shoulders, arms etc.), as bending and flexing is limited so they reach for items they need and do not use a lot of their torso. Then when they practiced using it and reaching they felt they could move with less effort and much further in the session (Le Long, 2014, p. 2).

From Week 1 participants also noticed changes in their body awareness. As Participant 1 commented during the body scan at end of the ATM in Week 2:

> I'm always surprised by how much of a difference it makes. I kind of go into it thinking 'my right side's useless I hate working on that side' and afterwards I'm like 'man that's crazy it's such a big difference'.

Comments included observations on sensations of size ("I feel bigger on my left", Participant 1 after exploring movement on the left), softness ("I feel softer and more sort of pliable", Participant 4), awareness ("I'm more aware of the whole", Participant 2), aliveness ("it's kind of like it's woken it up a bit", Participant 1) and security ("I feel more secure in my trunk region", Participant 4).

Participants also noticed that they were using more of the body in movement. These observations began in Week 1 with comments such as "it feels like my body wants to engage more…wow that's quite significant" (Participant 1), "the background movement. It feels a bit more natural to use it" (Participant 4).

They also became aware of changes in movement strategies with comments including "very different, using ribs, shoulders", "I can feel the hips opening a little bit" (Participant 2, Week 10), "Before I was like using just my shoulder. Now I'm kinda bending the core [pointing to waist and ribs] it's coming from here" (Participant 1, Week 2). Participant 4 (with a complete injury) commented:

> It's kind of like lying on the side and using the ribs and things like that I'm thinking crikey I've been in a chair 22 years now and have never ever thought about using those or

even knew that they were there that sort of mobility in your ribs and spine and things like that…so I'm definitely feeling some benefits (Participant 4, Week 2).

Participants also noticed improvements in balance, control and symmetry. For example, Participant 4 noted:

> It's good to feel balance now and it's good that I can feel that cause there's times you're sitting in your chair and you don't realize and your hips are, one's forward or you're sitting crooked and you don't really know…I can really feel like the work that we've done, putting the weight on the sitting bones and stuff can really help me to counterbalance because before I could counterbalance for a brief point and then I'd have to brace. I can counterbalance for <u>much</u> longer now (Participant 4, Week 7).

Participant 3 had initially had difficulty keeping his lower leg on the roller in Week 1. I suggested that he pay attention to the point at which he feels it is likely to fall off and then stay within that range. Once he had established a "safe range", he could work with gradually extending the range.[3] About five minutes later he pointed out to me that his leg was no longer falling off the roller. In Week 5, when we used the roller again, he was able to maintain control of his leg on the roller.

Comments about symmetry included "I think I'm sitting on them [sitting bones] more evenly" (Participant 2, Week 7) and "I actually feel straighter too surprisingly enough" (Participant 5, Week 7).

[3] I had successfully used this strategy in Phase 1 with a man with complete paraplegia (see page 101)

Participants also commented on how the lessons made them feel more relaxed. For example “It's a really unusual feeling because I don't think I ever move my hip without hitching it and it is so much more relaxing” (Participant 2, Week 1), “The spine feels more relaxed” (Participant 3, Week 10) and “I always come away feeling really good” (Participant 1, Week 6).

Occasionally participants reported some decreases in pain after some ATMs, for example “there's just not the pain that was there” (Participant 1, Week 10), “I get a lot of pain in my ribs and it’s definitely helped with that” (Participant 4, Week 4). However, this was not as common as the other benefits.

Knowledge and skills.

“Knowledge and skills” addressed the issue of whether or not participants had retained an understanding of the principles and were using the principles for their own exploration. During feedback in Week 10, participants discussed how they had begun reflecting on their movement since doing the programme. For example, Participant 3 reported:

> It is something that I often think about now, I’m conscious of things like I’ll reflect on things like this and then think ‘Oh, I’ll just give that a try’. Sometimes I’ll think ‘Oh, actually, I’m holding my jaw quite [tight], you know, I should be relaxing the jaw.’ So things like that, you reflect on them.

Participant 2 reported “I'm probably slowing everything down and thinking about where I'm moving and how I'm moving. That's different to anything else I've ever done. I think that's where I'm finding this of benefit.” For example, she had found it improved her awareness of how to reach.

> It's not until I've done this that I've really given a lot of thought to how I reach. Reaching is one that I've thought about and instead of just going like that [she reaches with arm] I'm more inclined to move myself more and get a better level of balance before I launch myself at something…You can stop and think about it if you've been given a few tools.

To begin with, when participants experienced pain or difficulty with the movements or positions it gave me the opportunity to demonstrate to them how using supports, changing the way they moved or using their imagination could remedy this. As the classes progressed I began asking them how they would solve the problems themselves and found that participants had learned to explore other strategies rather than trying harder. For example, in Week 12 I had instructed the participants to slide the right leg over the left. This can be very difficult to do if you try to move the leg only without engaging more of the body. Participant 2 was struggling with the movement so I asked her what she could do when she can't manage it. She replied "move your body". As she continued to have difficulty with this I asked her what you do when you still can't do it to which she replied "I find another way or think about it."

Participant 4 was having difficulty rolling one way so decided to explore rolling the other way and using different strategies "I'm going to see if I have more success going other way…If I put my arm here it gives me that little bit of gravity".

Throughout the programme I also gave them small tests to see if they could recall principles. For example, in Week 10 I asked "looking down, how would you make that easier?" to which Participant 1 responded "Breathing out." In Week 12 I named each of the principles to test their memory of them. It was clear from their responses that they had a reasonable understanding of the principles given how much ground we had covered in the 12 weeks.

However, there were a lot of principles covered and I needed to give them cues to remind them of the principles and what they meant. But, as Participant 2 said, she knew enough to know there were benefits.

Participants felt that they had gained some skills and confidence to explore movement with the assistance of tools such as the **Feldenkrais** CDs (Participant 2, Week 12) (Participant 3, Week 5) and some of them started using the principles to explore functions at home. For example, after the first lesson on exploring strategies for getting in and out of the chair (Week 9), in Week 11 Participant 3 showed us another strategy that he had been working on at home. Participant 2 started exploring getting from the sofa to standing at home. As she said "that spiralling is probably something I've been aware of more than anything else all week and I realise when I get off the sofa at home that I tend to go up front ways and it's so much easier to go left of that".

I also observed changes in strategy in class. For example, once I had taught participants how to roll onto the back, this became their preferred strategy for going from sitting to lying.

Sustaining change.

At times it appeared that they had sustained change from week to week. For example, in Week 3 I asked them to check whether they had sustained the improved range and ease of movement they achieved the week before. They all reported that they had maintained the ability to bend sideways. In Week 4 Participant 4 noted that he had retained his ability to turn left and bend forward as he had been practising.

Despite the difficulties they had with getting on and off the floor it appeared that, for Participant 4, this became significantly easier as the programme went on. In Weeks 1 and 2 he required assistance from the volunteer with getting back into the chair. In Week 3 he tried it

himself but needed some minimal assistance. In Week 4 he managed on his own but with some effort. In Week 8 he moved easily into the chair without assistance. By Week 12 he was getting back into the chair independently and with a significantly smoother action.

However, generally participants did not feel that they sustained change between lessons. In part this may have been due to the fact that working in the **Feldenkrais** way is new for them; it takes a while to learn to work in this focused way. In Week 6 Participant 3 said:

> I can't really say that I feel any great difference…My belief is that it is a long term programme that once I learn the techniques and I do it over and over over a period of time I will eventually start to reap the benefits. I'm not really aware of anything unless it aches or hurts and otherwise it's all good…it's a long term thing and it's something that's going to improve".

Participants also discussed the need for more lessons (more frequent or ongoing) to sustain changes in movement and pain. As participants commented "You definitely have to do it consistently…every single day would definitely be helpful", "Once a week is not as good." (Participant 1) "Although I can clearly see the benefits of the movements here, it's that constant reinforcement and repetition that I'm not getting to make these Feldenkrais movements an everyday part of my life. One session a week is not enough for me" (Participant 4).

There was a general consensus that one of the reasons that change was not sustained was because of the length of time that they had had their injuries. After injury they adopt the fastest way to achieve activities of everyday living. They had all had their injuries about two decades ago and their post-injury movement habits had become ingrained. It takes time to change them.

This was articulated as follows: “You realise you just stop doing things…You develop so many cunning little strategies to get away with moving” (Participant 2) and

> My perception of it is when you're in a wheelchair because it takes a long time to do a lot of things you spend a lot of time finding and developing tricks not so much to make it easier but to make it quicker because that sequence of things takes a long time …you look for cheats basically. After 15 odd 20 years all those little cheats become ingrained habits (Participant 4).

Even after learning the new strategy for getting on and off the floor (which most of them found easier) they eventually returned to their previous strategy. They all said the new strategy was easier but then went back to their old habits.

5. What changes would I need to make to the programme?

The answers to this question were divided into two themes:

- Ongoing modifications; and
- Future changes.

Throughout the programme, minor changes were made to the lessons to decrease difficulty and clarify instructions. For example, I included more demonstrations and introduced equipment that could assist with transitioning to and from the floor. I also planned changes for the next phase. For example, I made structural changes to the programme so that there was a clearer development of function and I introduced a one week break half way through the programme. I simplified some of the lessons, introduced the Weber-Fechner law, discussed the importance of comfort, labelled each lesson with a **Feldenkrais** principle to increase retention and developed more flexible homework including 20 minute body scans.

Ongoing modifications

There were a number of changes I made throughout the twelve weeks in response to their feedback and my observations. For example, during feedback in Week 6 participants requested that I demonstrate movements more throughout the ATMs to help clarify what they were meant to be doing. Generally when working with able-bodied clients we repeat the instructions in a number of different ways without demonstrating. This encourages the clients to imagine the movements and then perform them in their own way without copying the instructor. However, with this group it was very difficult for them to imagine the movements so I think having a role model was appropriate. From this point on I frequently demonstrated movements when they had difficulty, for example, as previously discussed, I demonstrated the movement of pressing the groin into the floor in Week 8. There were also a number of minor changes to ATMs that I decided to implement in the next phase such as reducing the complexity of the ATM in Week 1.

Seeing how much the group interaction, support, creativity and humour increased in Week 9 when they were exploring ways to get into the chair prompted me to make changes to some of the ATMs so that they involved more interaction between participants. For example in the ATM in Week 12 (an advanced lesson involving rolling from crossed legs to crossed arms) I encouraged participants to watch and learn from each other's strategies.

Partway through the programme I introduced a couple of pieces of extra equipment. These included a box which was half the height of the chair to assist with transition to and from the floor and a mirror. During feedback in Week 6 a couple of participants suggested that it would be useful to have mirror so that they could see themselves moving as this could help overcome the difficulties they had in being able to feel the movements.

Future changes

In addition to the ongoing changes, we also identified some significant changes that could improve the programme in the future. These included changes to the programme structure and content and a clearer focus on function.

I made a number of changes to the programme structure and content in order to promote easier and more enjoyable learning. For example, I swapped Lesson 8 with Lesson 9 so that they learned to roll to the front before doing a lesson from the front. (See Appendix 5.4 for the revised programme structure.) One of the most significant changes was orienting the programme more around function. When I designed my programme I started with thinking about which ATMs, principals and movements I wanted to teach and structured the programme around these ideas. Part of my initial reluctance to focus on function was because I was aware that many disabled people have been under considerable pressure to improve their function. I did not want to increase this pressure. However given their obvious engagement in the exploration of function, I discussed changing the programme so that we started exploring functions such as rolling onto the back earlier in the programme. Participants agreed that this was a good idea “that's right, do that earlier on and maybe even that one where you get back into the chair” (Participant 5). I thought I should also more clearly focus on two or three key functions such as wheeling the chair or putting the chair into the car. Again participants agreed with this idea “It's attaching each lesson to something you do every day” (Participant 2).

This prompted me to reorder the lessons and group them according to function. I focused on a few specific activities of daily living that are difficult for them or that they do frequently, for example, wheeling the wheelchair or getting the wheelchair out of the car and used these to guide the structure of the programme for the next phase. I thought that that would enable them to

evaluate the ease with which they do the activity and see if that changes throughout the programme and would enable me to create more focused and meaningful homework.

Ensuring that the lessons are relevant to everyday life and so reinforced by their daily function enhances maintenance of learning. One of the ways in which functional improvements are demonstrated is via the reference movement. A common reference movement in able-bodied classes is walking. Improvements can be immediately obvious as participants walk in and walk out of the class and walking is very clearly a whole body movement. When a participant learns to use the whole body in rotation, for example, this makes walking easier. They leave the lesson with a new way of walking and the newfound sense of the body is reinforced by the act of walking. This may not be so straightforward for someone with an SCI. After an ATM, where they experience the use of the whole body, they once again return to the wheelchair and use of the body is limited so they may not automatically practise their new learning.

However, as the programme progressed I saw that there were a number of activities that they did during class and after class which reinforced the learning in the ATMs. For example, the rolling from the back to the side lesson was reinforced when they changed positions in ATM. The extension and flexion lessons were reinforced when they wheeled their chairs. The rotation lesson was reinforced when they put their wheelchairs into their cars. The participants found that these functions became easier as they learnt more effective strategies. They seemed to really enjoy the group exploration of different strategies for getting onto the floor and back into the chair in Week 9 and it very clearly demonstrated how moving in a spiral improved ease of movement. I didn't start focusing on these as functions until Week 8 and there was limited time after this lesson for them to adopt the new strategies.

I also thought it would be a good idea to have a break halfway through the programme. For me, the programme was a long haul and I felt the lessons were too frequent as, throughout the programme, I experienced significant nausea and fatigue. Given that the absenteeism was highest with those with children, it occurred to me that it could have been partly due to school holidays. I thought that the participants might also be finding that 12 weeks was a long programme so I proposed a two week break for school holidays in the next phase. However, they didn't think this was necessary. "I didn't mind going through the school holidays I thought we could go straight through" (Participant 5). They found that the weeks were going fast and they looked forward to the classes even though getting to class was a hassle "Having a two-week break would be great in terms of not having to come here which would be lovely. To come here is a bitch but being here is great. I would miss doing Feldenkrais" (Participant 1, Week 7). However there was recognition that giving them a break could help to foster independence. "You do get lulled into knowing that you'll be able to take us through it each night - that reliance that starts to build up" (Participant 2, Week 10).

For the next phase I decided to change the programme to an 11 week programme with a one week break during school holidays after Week 6. In order to reduce the number of classes I removed Lesson 10 (which included an ATM on extension and flexion) and moved some of the content of Lesson 10 into the flexion lesson. It made sense to remove lesson 10 as it was the most redundant of the lessons. There were already separate lessons on flexion and extension and one of the chair lessons involved flexion and extension. In addition, a couple of the participants had had a lot of difficulty leaning back on their hands which was a predominant position in Lesson 10.

At times my participants were confused by my instructions. Sometimes the confusion was followed by clarity indicating that participants may have been learning. However, given that sometimes clarity did not follow reinforced for me the importance of keeping lessons simple. I made specific ATM changes so that they were less complex and more within the participants' capabilities. Examples include making the ATM in Week 12 (an advanced lesson involving rolling from crossed legs to crossed arms) more free-flowing and playful and removing the step where participants pressed their feet against the wall from the side bending ATM as they couldn't really feel it.

To simplify further, I labelled each lesson with a simple phrase to describe the **Feldenkrais** principle that they were learning, for example "Use gravity" and "Move from your centre". This was to enable greater retention of the lessons and provide more focus for their homework. These labels then served as a set of 12 guidelines for movement exploration at the end of the programme.

As issues such as spasticity and nausea affected some of the participants I thought it would be worthwhile spending more time discussing comfort and how to remedy spasticity earlier in the programme and give them the option of resting on their side from the beginning. I decided to include a discussion around hip joints earlier in the programme as it appeared that awareness of the hip joints could be important for reducing spasticity. I would also advise them when I was going to teach sitting lessons so participants with nausea would know to take medication in advance.

I think it is important that participants know that they do not have to complete every lesson but can adapt and make their own adjustments of necessary. In the end, what is important is not whether or not they complete every step of the programme but what they get out of it.

When I did my training I was far less able-bodied than most of my fellow students. I was unable to do many of the ATMs, yet for me the training was effective because I was able to work at my own pace and adapt to the ATMs as I saw fit.

I also decided that in the next phase I would run the class during the day. At the same time as getting feedback and making decisions on the spot on how to change the programme, I was teaching a new programme to disabled people. I found teaching ATM to disabled people more complex than teaching to able-bodied people as you cannot make assumptions that they have the capacity to move and feel and their abilities are more diverse than the able-bodied. For example, with an able-bodied group you can make the assumption that they all have the capacity to use their legs. With a disabled group, some are able to initiate movement from their legs, some are not. Some can feel their legs, some cannot. We do not know whether those that are unable to feel or move their legs have the capacity to learn or whether it is a neurological impossibility. I found that I had to demonstrate movements even more frequently than I had planned for as it appeared that the visual cues were more important with this group then with able-bodied groups I had worked with. All of this was tiring so I thought that running the class during the day would enable me to manage my fatigue better and would also mean that the participants would be fresher. I would have to organise extra disabled parks and it could require flexibility on the part of the participants but my experience from this phase suggested that participants could be open to being flexible. Although two of the participants in the first phase had said that they wanted the classes to be in the evening, they later told me they would have modified their schedules to come during the day if necessary.

The participants were continually surprised about how much movement they gained when they reduced effort. This challenged what they had been taught previously and at times I

think they were unable to see how this was possible. I thought that if I had spent more time explaining the science behind why this works, then the participants may have been quicker to accept that the changes they were experiencing were backed by scientific principles. Given this, I decided that in the next phase I would teach them about the Weber Fechner law. According to the Weber Fechner law, in order to notice a change in stimulus, the stimulus must be changed by at least 1/40 times its original size (Wikipedia). For example, a bag weighing 40kg will require the addition of or removal of 1 kg for the person carrying to notice the change in weight. Similarly by reducing effort in movement, we are more able to attend to how we are moving. Understanding that there is a scientific basis for the experience may help to validate their experience.

The uptake of the homework ATMs was not great. Participant 2, the only participant who was able to walk independently, was the only one who chose to do all the homework ATMs. Despite the poor uptake, I felt that it was still of value to give them optional homework to practise either during the course to reinforce the learning or at the end of the course so they could keep up their own practice. However, I needed to think more broadly than what I was offering them.

During the development of my programme, Dr Goldfarb asked me why I chose additional ATM lessons as homework. He wanted to know what other strategies I had used. I don't believe I paid enough attention to his question. During the programme, I was able to increase their homework options by listening to what the participants spontaneously did for homework. For example, Participant 5 appeared to be very committed to the programme and yet he did none of the prescribed ATMs. However, he did his own short explorations at home to reinforce his learning. Participants also suggested changes to the homework. They thought that it would be

really useful if homework could be part of everyday life rather than something separate that you have to do. One popular idea was doing body scans on their beds as part of their homework. This was because working from the bed was easiest for them ("if you can do more things in bed it's easier as well because you're spending a reasonable amount of time in bed and it's your personal space", Participant 3), it would help increase their skills in visualisation ("yeah I think that's a good idea because that would help people get used to the visualisation and understanding what body part was what", Participant 5) and could help them get to sleep ("probably the body scans good cos you go to bed and you go to sleep and that's a good way of getting to sleep", Participant 1). I also suggested that I put images of movement into the homework sheets which again participants agreed with. For some, seeing an image of what they had done would help the recall of the lesson.

Given this, for the next phase I developed some simple homework exercises that didn't require getting on and off the floor and finding space and time. These included 20 minute body scans that could be done in bed, 5-minute ATMs that could be done in the chair (based on the lesson that they did that week) and exploring strategies for functions at home such as getting into and lying down in bed. In addition to being more convenient for them, I thought that getting into the habit of focusing on themselves in this way could improve their focus in class and get them into the habit of practising. I also created MP3 files of the ATM lessons I taught in class so that they could review what they had learnt that day. In order to allow better management of the homework, I put the homework onto the University of Canterbury Learn website. This would mean that participants could access MP3 files and PDF files for the current and previous week's homework.

Although the failure to do the homework ATMs was in part due to lack of time, it also could indicate the priority they gave to it. I felt that I could spend more time in the programme discussing the benefits of doing homework. The value of homework goes beyond movement improvement; taking time out daily to focus also leads to better concentration and improved relaxation. I felt that I could also allow participants who completed homework more time to discuss the benefits of doing homework. They could then serve as role models to others. Participant 3 thought that it would also be a good idea if, next time I ran the programme, I discussed the resistance to doing homework created by transitioning from a state of busyness as described on page 119.

Another deterrent may have been an apparent lack of progress. Movement habits that have been present for decades can be slow to change and staying motivated can be a challenge. Partway through Phase 2, I included a discussion on the ups and downs of **Feldenkrais** exploration; that improvement is not a simple straight path. I thought that I should introduce this earlier in the programme.

I also decided to make a couple of minor modifications to my preliminary interview. The key purpose of the preliminary interview was to give the participants the opportunity to discuss any concerns or issues and their hopes and expectations and to allow me to pick up the consent forms and fill out the Participant Details Form. I didn't record the preliminary interview as I felt this would allow participants to talk more openly, particularly as this was the first time that they had met me. However, participants made in-depth comments and told stories that gave insight into issues such as the challenges that they had experienced in trying to find activities that catered to their needs. It was difficult to fully record those stories using hand written notes. I

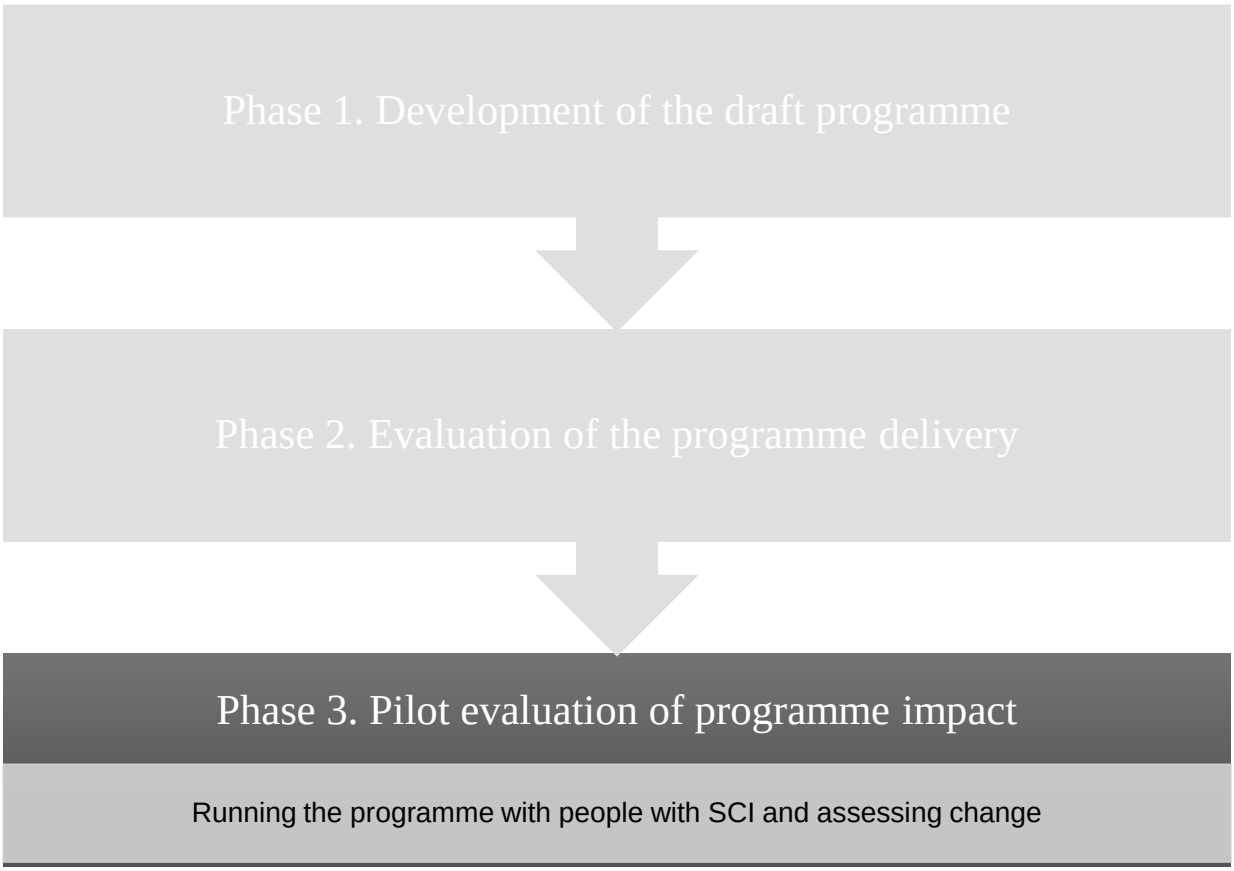
decided that for the next phase I would take an audio recorder and give them the option of being recorded.

During the preliminary interview I pointed out that attendance every week was not critical; one of the reasons I had so many lessons was so that participant learning would not suffer unduly if they missed a few classes. For the next phase I decided not to make this point as this may have encouraged participants to undervalue the individual classes and not make attendance a priority.

In the Next Chapter

In this chapter I have described Phase Two of my study where I evaluated the programme delivery with a group of people with SCI and revised the programme. In the next chapter I will describe Phase Three where I evaluated the impact of the revised programme with a new group of people with SCI.

Chapter 6. Phase 3: Pilot Evaluation of Programme Impact - Methods



In the previous chapter I outlined Phase 2 of my study in which I evaluated the programme delivery with a group of five adults with SCI. In this chapter I will describe Phase 3 in which I evaluated the programme and packed with another group of people with.

Purpose

Phase 3 was a pilot study that aimed to explore the impact of the programme developed in Phase 2 on a new group of adults with SCI. I wanted to find out whether the programme had influenced their postural stability, ease of movement and function, body awareness, movement strategies and perceptions of control of pain, spasticity and fatigue. I also wanted to identify how

acceptable the participants found the programme and whether or not there were any unforeseen effects of the programme.

Research Questions

1. What effect did the programme have on postural stability, ease of movement and function, body awareness and movement strategies?
2. What effect did the programme have on symptom control?
3. Was change sustained for the participants?
4. Did the participants gain knowledge or skills that they could use beyond the completion of the programme?
5. What were the participants' overall attitudes to the programme?

Research Design

During Phase 3, I used a concurrent triangulation mixed methods design. In this type of design, qualitative and quantitative data are collected at the same time and analysed separately. Collecting both quantitative and qualitative data provides a deeper understanding of a phenomenon of interest than would be obtained by collecting either type of data individually (Hanson, Creswell, Clark, Petska, & Creswell, 2005). Different types of data can produce different results because different types of data are sensitive to different real world nuances. Inconsistencies do not necessarily weaken the credibility results but can provide deeper insights (Patton, 2002).

I chose to give the qualitative data priority. With qualitative priority a greater emphasis is placed on the qualitative methods and the quantitative methods are used in a secondary role

(Creswell & Clark, 2011). Placing more emphasis on the qualitative data ensured that attention was paid to the variables of interest to the participants and not just variables predetermined by me.

Qualitative evaluation enabled participants to elaborate on the findings of the quantitative evaluation and discuss related issues not covered by the quantitative outcome measures and provided a check that the questionnaires were measuring the constructs that they were designed to measure with this group. This is in line with The New Zealand Disability Strategy 2001, Action 10.1 which aims to "enable disabled people to put forward their own experience in the context of research" (Dalziel, 2001, p. 24).

Participant Recruitment

Participants were a group of five volunteers with SCI who met the following criteria.

1. They were capable of getting on and off the floor unassisted.
2. They were over the age of 18.
3. They were able to communicate effectively and understand English instructions.
4. Pain, spasticity and/or fatigue were interfering with their quality of life.
5. They were at least one year post injury. This ensured that the pain experienced was not due to the initial acute injury.

I began recruitment for this phase in 2016. Recruitment was as for Phase Two. In addition there was a news item on NewstalkZB radio station and I wrote a blog for the Attitude Live website. Attitude is a media company that uses authentic stories to change perceptions around health and disability (Tanya Black, personal communication, 13 July 2017). I also emailed people that had shown interest in the previous study and met the criteria. In the previous phase,

many people contacted me as a result of an article in *The Press.* However, this time *The Press* would not publish an article on my research without a case study (with names) or quantitative results from the previous phase. As the results from the previous phase were qualitative and analysis had been done at the group level only, I could not meet their requirements.

I had 16 expressions of interest from prospective participants. Of these, four were from out of town, five did not meet the criteria, two couldn't commit to the time, one was scheduled to have surgery in the middle of the programme and two didn't follow up after receiving the information sheet. Two people met the criteria and were available to attend the programme.

A few weeks before the programme was to begin, I suspended my PhD for personal reasons. So, in 2017, I began recruitment again. This time recruitment was more successful and, for the most part, involved contacting the people that had assisted me with recruitment in the previous phase. Star Media (a local multimedia company) produced articles in their community papers and on their website and I wrote another blog for the Attitude Live website. The two eligible participants from 2016 were still committed to participating. Eight more people enquired about the programme, three of whom met the criteria and committed to going ahead. I sent all potential participants an Information Sheet (Appendix 6.4), a Consent Form (Appendix 6.5) and a Participant Details Form (Appendix 6.6).

Procedure

Participants individually attended the preliminary interview. During this interview I also picked up the Consent Form and Participant Details forms, instructed participants on how to complete the questionnaires (see page 164) and administered the seated reach and rotation tests. At this stage I determined whether or not participants would be able to complete the self-report

measures or whether alternative means for completing were necessary. All interviews took place at Otakaro 116, were approximately 1.5 hours long and audio recorded. Details of the interviews are provided in Appendix 6.3.

Participants attended the programme developed during Phase 2. Classes were videoed, enabling video-mediated recall of each session and participants' feedback. Videos were made available to participants. Throughout the programme, participants completed the questionnaires and the seated reach and rotation tests and attended the interviews as shown in Table 2 (see page 173). The programme ran on Mondays from 4-6 pm over 12 weeks beginning 21 August. The setting and equipment and resources were as for Phase 2.

Participants individually attended the follow-up interview. For three of the participants, the follow-up interview took place three to six weeks after the intervention. For two participants, the follow-up interview took place over three months after the intervention. During this interview the seated reach distance tests were applied. All interviews took place at Otakaro 116, were approximately 1.5 hours long and audio recorded. Details of the questions for feedback and the interviews are provided in Appendix 6.3.

Data Collection

Data were collected from both qualitative and quantitative sources. These sources are outlined below.

Qualitative data sources.

Qualitative data were collected on observations relating to postural stability, ease of movement and function, body awareness and movement strategies, symptom control, knowledge and skills, participation and attitude to the programme. Data came from:

- the preliminary interview;

  The preliminary interview took place before baseline and gave the participants the opportunity to discuss any concerns or issues they might have and thus ensured participants' individual needs could be met.

- feedback from participants at the beginning and end of each class;

  I noted some of this feedback immediately after class. Other feedback came from reviewing the videos.

- feedback from physical education student volunteers;
- the follow-up interview;

  This interview gave participants the opportunity to discuss how they found the programme and any changes that they had noticed as a result of the programme.

- body awareness test;

  As I was unable to find any tests in the literature that demonstrated participants' awareness in movement I developed the following test. During the interviews participants were provided with outlines of the human body and asked to "Imagine that you are about to reach to pick up a cup of coffee from a table to your right. Reach right. What parts of yourself do you feel are involved in the movement? Colour these parts in the body diagrams" (using a 2B pencil). This test was carried out at the preliminary interview (before the programme) and at the follow-up interview (after the programme) in order to provide a visual image of change.

- emails from participants; and
- data on participants' access to the homework on the Learn site.

Quantitative data sources.

Outcome measures included measures of the impact of pain, spasticity, and fatigue; personal control (Appendix 6.1); perceived exertion (Appendix 6.2) and seated reach distance. The measures were mainly self-report because this gave an indication of how the programme was affecting the daily life of participants from the participants' perspectives and ensured that outcomes were relevant to this group. When using self-report measures in the SCI population, the fact that people with high level lesions may have limited writing ability and difficulty completing certain measures must be taken into account. Oral administration of self-report measures has been suggested as an alternative when working with this population (Turner et al., 2001).

Impact of pain.

The impact of pain was measured by a subset of the International Spinal Cord Injury Basic Pain Data Set (ISCIBPDS) (Cardenas & Felix, 2009; Jensen et al., 2010). The ISCIBPDS was developed so that health professionals could collect standardised information on pain problems in individuals with SCI. A subset of the ISCIBPDS has been identified as suitable for treatment outcome studies (Jensen et al., 2010). The resulting questionnaire includes six pain interference items and questions about pain intensity. Pain interference items require participants to report to what extent pain has limited general activity and interfered with social, recreational activity and family-related activity (LSF); and interfered with day-to-day activities, mood, and sleep (AMS). Summing these items provides a measure of Total Interference. Pain intensity items require participants to identify up to three worst pain areas and rate the average intensity of each over the past week using a numerical rating scale (Jensen et al., 2010).

Validity criteria measures were established with 184 adults with SCI and pain using the Mental Health Scale of the SF36 and the Medical Outcomes Study Sleep Problem Index. These have shown validity and reliability in other studies (Jensen et al., 2010). Validity of the interference items was supported with stronger support for the AMS items than the LSF items. Internal consistency coefficients for the AMS scales were .94 (for the Activities scale), .91 (for the Mood scale) and .89 (for the sleep scale) and the internal consistency for the Total Interference scale was found to be excellent (Cronbach's $\alpha = .94$), suggesting that the LSF items may not be necessary to assess pain interference (Jensen et al., 2010). The LSF items were removed for this study.

Validity of the worst and second worst pain intensity ratings was supported, with moderate to strong associations between these items and the pain interference items. Validity of the third worst pain intensity ratings was not as strongly supported (Jensen et al., 2010) so for this study assessment of the third worst pain was removed from the scale.

Impact of spasticity.

The impact of spasticity was measured by the Spinal Cord Injury Spasticity Evaluation Tool (SCI-SET). The SCI-SET is a 35-item, seven-day recall questionnaire that was designed to capture both the negative and positive effects of spasticity on daily life. The questionnaire allows participants to rate the impact of their spasticity on a 7-point scale from extremely problematic (-3) to extremely helpful (+3). It takes about four to nine minutes to complete (Adams et al., 2007).

Evaluation of SCI-SET has shown it to have good face validity with participants giving the scale a mean rating of 4.4 ± 0.6 out of 5 for relevance and suitability. Internal consistency ($\alpha = .90$) and test-retest reliability (ICC = .91) were adequate. Construct validity was supported

by statistically significant (p<.001) moderate to strong correlations with scales measuring related constructs including self-assessed spasticity severity (r = -.48), self-assessed spasticity impact (r = -.61), The Penn Spasm Frequency Scale (r = -.66) and the Quality of Life Index SCI Version-III health and functioning subscale (satisfaction) (r = .68) (Adams et al., 2007).

Impact of fatigue.

The impact of fatigue was measured by a modified version of the Fatigue Severity Scale (FSS) (Anton, Miller, & Townson, 2008; Krupp, LaRocca, Muir-Nash, & Steinberg, 1989). The FSS is a 9-item questionnaire that measures the effect of fatigue on function. Participants choose on a 7-point ordinal scale, ranging from 1(strongly disagree) to 7(strongly agree), the extent to which they agree with statements about their fatigue. It was originally developed for multiple sclerosis, but it has been extensively validated in other settings and is possibly the most widely used measure of fatigue in neurological conditions (Anton et al., 2008). A study evaluating the psychometric properties of the FSS with people with SCI found it to have excellent internal consistency (Cronbach's α= .89) and adequate test-retest reliability (ICC = .84, p <.05*).* Item-by-item reliability ranged from low (ICC= .32) to high (ICC= .77) (Anton et al., 2008).

Validity was found to be adequate and was determined by comparing scores on the FSS to scores on the visual analogue scale for fatigue (VAS-F), the vitality scale of the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) and the Centre for Epidemiologic Studies Depression Scale (CES-D). The VAS-F is a single item visual analogue scale used widely in fatigue research. The SF-36 is a widely used measure for assessing health related quality of life that has shown to be reliable in many settings. The CES-D has been used widely to measure depression in the general population and there is a clinically significant overlap between depression and fatigue. The magnitude of the relationship with the VAS-F (r= .67) and the CES-

D (r= .58) was as hypothesised. However, the relationship with the vitality scale (r=-.48) was less than the hypothesised value of r>-0.7 (Anton et al., 2008).

For this particular study, this was changed to an 8-point scale (ranging from 0 to 7) in order to increase sensitivity. Two items were removed from the scale: Item 1 - My motivation is lowered when I am fatigued, and Item 2 - Exercise brings on my fatigue. These two items had lower reliability coefficients (.32 and .42 respectively) than other items in the scale. The mean score for Item 1 was the highest. On the face of it, this is to be expected. Stating that one strongly agrees that “motivation is lowered when I am fatigued” is not really a statement about one’s current fatigue levels. One could strongly agree or disagree with this statement regardless of fatigue levels. Anton et al. (2008) suggest that Item 2 may be of limited relevance to people with SCI as many people with SCI may have a reduced capacity to exercise.

Personal control.

Personal control was measured using a modified version of the personal control subscale of the Revised Illness Perception Questionnaire (IPQ-R) (Moss-Morris et al., 2002). This scale can be modified by replacing the word "illness" with the name of the particular illness or condition under study ("Using and Scoring the IPQ-R Subscales,"). For my study, I changed the word “illness” to “symptoms”. At my supervisor’s recommendation I also modified Item 3. This originally read “The course of my symptoms depends on me”. However this item had the potential to be confusing; participants could read it as the “cause of my symptoms”. Given this, I changed it to “How my symptoms change over time depends on me”.

The IPQ-R personal control subscale has been shown to have good internal reliability (Cronbach's $\alpha = .81$) (Moss-Morris et al., 2002) when tested with participants from eight illness groups: asthma, diabetes, rheumatoid arthritis, chronic pain, acute pain, myocardial infarction,

multiple sclerosis and HIV. Test-retest reliability with a group with rheumatoid arthritis where the interval between tests was six months was .57. Although this is not particularly high, this may be an indicator that the personal control subscale is sensitive to change.

Perceived exertion.

Perceived exertion was measured using the Borg Rating of Perceived Exertion (Scale (RPE) (Borg, 1998; Isakovic-Cocker, 2006). The RPE has been used in the assessment of perceived exertion in a number of settings including fitness training, rehabilitation, ergonomics and epidemiology studies. It enables measurement of the difficulty and fatigue one experiences when doing a given physical task. Summarising reliability studies, Borg (1998) concludes that the RPE has very high reliability, generally above .90. Content validity was obtained by measuring correlations between observer and self-ratings and was calculated to be very high (.96) (Borg, 1998).

Throughout the study participants were required to perform a series of movements (at the same time of day each time) and then rate the degree of exertion required to perform each movement. Movements assessed were based on the movements taught in the ATMs and were as follows:

- lateral flexion right (Side bend right to touch the floor and come up again);
- flexion (Bend forward to touch the floor with left hand and come up again);
- extension (Reach up with right hand to point to the ceiling, looking at the hand);
- arm lifting (Raise left arm to the left at shoulder height and hold for 5 seconds);
- rotation left (Rotate to touch the top rim of the left wheel with right hand);
- transfer weight left (Transfer weight to left buttock and hold for five seconds); and
- transfer weight right (Transfer weight to right buttock and hold for five seconds).

Participants were also required to rate the degree of exertion required to perform a number of functions. These included:

- bending forward to take off your shoes;
- getting onto the floor;
- rolling onto your back;
- rolling onto your left side;
- getting into your chair from the floor;
- reaching up to get an object from a high shelf;
- wheeling your chair (for those using wheelchairs);
- standing (for those able to stand);
- walking (for those able to walk);
- rotating as if to put your wheelchair in your car; and
- rolling over in bed.

Seated reach and rotation.

Seated reach and rotation was measured using a modified version of the seated reach distance test. The seated reach distance test is designed to measure participants' ability to reach as far as possible in different directions without falling. In this test, a large table is positioned with its closest edge at the height of the iliac crest and in line with the greater trochanters of the participants. A semicircle is cut out of the table to enable room for the participants' abdomens. The table is covered with a paper sheet with 5 pre-drawn lines 1)lateral right, 2)lateral left, 3)45° right, 4)45° left and 5)forwards. A pen is taped to the participant's thumb and participants are required to reach as far as possible along each line, marking the farthest point to which they can reach. Seated reach distance is calculated as a proportion of arm length whereby arm length is

measured from the acromion process to the position of the pen in the thumb web space (Boswell-Ruys et al., 2009).

The seated reach distance test has been tested with a population with SCI and has been found to have excellent test-retest reliability (ICC= .80-.89, $p<.05$). Construct validity was determined by comparing scores to ASIA scores, level of lesion and time since injury. Scores on the seated reach test were significantly correlated to ASIA motor scores and participants with high lesions (C6-T7) performed significantly worse than participants with low lesions (T8-12) in half the reach directions in the seated reach test. There were also significant correlations ($p<.05$) between the scores on this test and other postural stability tests including Upper-Body Sway, Maximal Balance Range, Co-ordinated Stability, Alternating Reach and T-Shirt (Boswell-Ruys et al., 2009).

In order to have evaluated how significant the reach results were it would have been useful to have been able to compare the results to the results of other studies on stability interventions. This, however would have meant using the same tests, for example the Modified Functional Reach Test which assesses a person's stability by measuring the maximum distance an individual can reach from the sitting position. In this test a yardstick is mounted on the wall, the participants arm remains horizontal to the floor and the distance reached is obtained by measuring how far a position on the arm (such as the 3rd metacarpal) moves along the yardstick. One of the disadvantages of this test however is that if participants are unable to hold their arm up, they would be unable to perform the test.

Because of budgetary and space limitations, it was not feasible to use a table with a semicircle cut out. For this study, I used a 1.2m long table to assess horizontal reach. A 2.5 metre Perspex-covered rod attached to a base enabling it to stand vertically was used to assess vertical

reach. Several reach tests were performed. Before each test I advised the participants which test they were about to do. As I was testing how they function in the real world, no specific instructions were given on where in the chair they were to sit. How they chose to sit in the chair was their choice and this could have changed throughout the programme. However I ensured that the relationship between the chair and the table was kept constant and participants locked the brakes on their chairs when their chair was in position.

The tests were as follows.

1. Lateral reach right. Participants sat at the left-hand corner of the table with the right push ring touching the table leg (see Figure 2). For non-wheelchair users, the front right leg of the chair was aligned with the left side of the table leg. From this position they were required to push a roll of solder wire (weight 200g), as shown in Figure 3, held between the right thumb and forefinger as far to the right as was comfortable without leaning the arm or the hand on the table and without using the arms to bring themselves back up to upright. Measurement was taken from the left side of the table to the left side of the object.

Figure 2. Wheelchair push ring

Figure 3. Roll of solder wire

2. Rotating right. From the same starting position as 1, they were required to push the solder with their left hand (between thumb and forefinger) as far to the right as was comfortable without leaning the arm or the hand on the table and without using the arms to bring themselves back up to upright. Measurement was taken from the left side of the table to the left side of the object.
3. Lateral reach left. This was the reverse of lateral reach right.
4. Rotating left. This was the reverse of rotating right.

5. Forward reach. Participants sat at one end of the table with their lower legs touching a horizontal strip of wood as shown in Figure 4. Participants were required to push the solder with the left hand as far forward as was comfortable without leaning the arm or the hand on the table and without using the arms to bring themselves back up to upright. Measurement was taken from the edge of the table to the back of the object.

Figure 4. Horizontal strip of wood

6. Upward reach. Participants sat with the right rear wheel touching the left side of the stand, the centre of the wheel lined up with the back of the stand (or the front chair legs lined up with the vertical arm of the stand for non-wheelchair users). With their thumb touching the largest of the three small ovals on the whiteboard marker pen shown in Figure 6 (pen between right thumb and forefinger) participants reached upwards as high as was comfortable without using the arm to support themselves and marked a point on the vertical arm of the stand. Measurement was taken from the base of the vertical arm to the mark.

Figure 5. Marker pen

Figure 6. Stand

As the seated reach distance tests required my assistance the end of baseline test was performed before the first class, the end of intervention test was performed at the end of the last class and the post intervention test was performed at the time of the follow-up interview. All measurements were confirmed by the participant and/or a student assistant. Participants were given the option of completing the other tests online (via the University Learn site) or on paper. All participants chose to complete the tests online.

Data collection schedule

Table 2 shows the schedule for the administration of the tests and interviews. The symptom scales referred to in the table are the ISCIBPDS (impact of pain), the SCI-SET (impact of spasticity), the FSS (impact of fatigue), and the IPQ-R (personal control). The perceived exertion tests were completed twice weekly throughout baseline and weekly from thereon. The timing of the post intervention seated reach distance test and follow-up interview varied with each individual as they were carried out at times that suited the individual participants. These were as follows: Participant 6 - one month, Participant 7 - 3 weeks, Participant 8 - 3 months, Participant - 9 3½ months, Participant 10 - 5 weeks.

Table 2. Data collection schedule

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17-31
	Baseline				Intervention												Post intervention
Symptom scales	✓			✓						✓							
Seated reach distance	✓				✓					✓						✓	✓
Ease of function	✓			✓						✓							
Perceived exertion	✓ x2	✓ x2	✓ x2	✓ x2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Weekly feedback					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Preliminary interviews	✓																
Follow-up interview																	✓

Qualitative Data Analysis

Qualitative data were analysed using the general inductive approach used in Phase 2 as this is a simple approach to analysing data when using focused evaluation questionnaires (Thomas, 2006). Validity was established by a number of approaches including member-checking and triangulation (Creswell & Clark, 2007). Member-checking is a frequently used approach to establishing validity in qualitative studies. In this approach the investigator takes summaries of the findings to participants and asks them whether the findings accurately reflect

their experience (Creswell & Clark, 2007). Triangulation is achieved by drawing data from several sources or from several individuals (Creswell & Clark, 2007).

I analysed the data using a general inductive approach described in Chapter 5. One of the advantages of inductive analysis is that it allows one to identify unanticipated effects from programme implementation. This means that, although the evaluation questions provide a focus for conducting the analysis, they are not a set of expectations about the findings. This is unlike deductive analysis where a specific hypothesis, theory or model is being tested (Thomas, 2006).

Quantitative Data Analysis

Quantitative data analysis was done using the methods developed within single-case research studies. Single case research studies are not case studies, but use systematic replication of an intervention (Morgan & Morgan, 2009) across participants, behaviours or situations to provide evidence that treatments have had an effect on the dependent variable(s) of interest. Repeated measurement of the dependent variable before, during and after applying an intervention (the independent variable) enables (tentative) causal inferences to be drawn about the effect of the intervention (Kratochwill et al., 2010).

Single case research designs are divided into phases with the dependent variable being repeatedly measured throughout all phases. During the baseline phase (A), there is no intervention. During the intervention phase (B) an intervention is applied. For some studies there is a return to baseline phase whereby the treatment is withdrawn (ABA design). The purpose of this is to determine whether or not changes were due to the intervention or some other variable. It is assumed that withdrawing the intervention should cause the dependent variable to return to its baseline level. However, for some interventions the changes are enduring even after the

intervention has been removed and one would not expect the dependent variable to return to its baseline level. For example, for an intervention such as CBT where learning takes place, one would hope that changed behaviour would endure once the treatment has been withdrawn (Morgan & Morgan, 2009).

The results of single case research studies are quantitative and can be represented graphically for visual analysis. Visual analysis is a highly effective technique for detecting clinically significant change during and following interventions, with a breadth claimed to be not equalled by any other data analysis technique (Parker & Hagan-Burke, 2007).

Each participant provides his/her own control with repeated measurement of the dependent variable allowing comparison between the dependent variable during baseline (no intervention) and during intervention. Internal validity is further established by replication of the effect, i.e., by repeating the experiment with other participants (Morgan & Morgan, 2009).

Because replication is more feasible in single case research designs than in large group studies, single case research designs are effective in establishing generality across participants, procedures and settings. External validity can thus be established through replication rather than through statistical inference as in large group studies (Blampied, 2013; Morgan & Morgan, 2009).

Single case research designs are known to be particularly useful in assessing the impact of health interventions (Morgan & Morgan, 2009), are useful for studying conditions which have a low prevalence (Kratochwill et al., 2010) and recognise that, although participants may fit a particular diagnostic category, they have unique attributes (Blampied, 2001, 2013). They enable research to be conducted at the level of the individual, thus accommodating the uniqueness of individuals and flexibly adapting the research to individual circumstances. At the same time, the

experimental rigour and quantitative data of the standard paradigm is maintained. Whereas RCTs can mask the fact that individuals may have had no change or in fact deteriorated, single case research studies enable analysis at the individual level. They enable clinical innovations to be rigorously investigated without exposing large numbers of individuals to unproven procedures (Blampied, 2001, 2013). They allow observation of the process of participant change and enable researchers to document the characteristics of participants who do not respond to the intervention. If a participant is not responding, the independent variable can be revised and recalibrated (Kratochwill et al., 2010) and thus the intervention can be readily improved without the requirement to instigate a completely new study.

Being able to work at the individual level enables practitioners to ascertain whether or not an intervention produces clinically significant change. The traditional convention in scientific research is to determine whether or not there has been a statistically significant change where statistical significance refers to the probability that the value of a test statistic (for example the difference between two group means) is larger than that likely to be observed under the null hypothesis that the two groups are samples from the same population. Whereas this is regarded as useful in large group research design, in an applied setting health professionals are frequently more concerned about clinical significance, i.e., whether or not the intervention makes a difference to their client in the real world (Morgan & Morgan, 2009).

Another advantage of single case research studies is that it is easier to replicate the study than with large group studies. This replication can be either direct replication involving the exact duplication of the study but with different participants or systematic replication where the study is replicated but with some specified difference. For example, the intervention could be delivered

in a hospital setting and then repeated in the client's home. This enables the researcher to determine the robustness of the intervention (Morgan & Morgan, 2009).

Although ideally scientific validity is enhanced by taking repeated baseline measures over a prolonged period of time, in an applied setting researchers rarely have the opportunity to conduct baseline measurement as long as would be considered optimal in a laboratory setting. Practical issues such as time constraints and ethical issues mean that compromises need to be made (Morgan & Morgan, 2009). In the present study, it wasn't practical to obtain repeated measurements of reach. The test required that the participants come to my office which would have meant a considerable amount of time and effort on their part. In addition, if the test was repeated too frequently, any improvements could have been attributed to repeated practice of the test rather than the programme. For practical purposes, the reach test was performed only twice at baseline for each participant.

In the Next Chapter

In this chapter I have described the methods used in Phase 3 of my study whereby I evaluated the impact of the programme on a group of people with SCI In the next chapter I will present the results of Phase 3.

Chapter 7. Phase 3: Pilot Evaluation of Programme Impact - Findings

In the last chapter I described the methods used in Phase 3. In this chapter I will present the findings of Phase 3. I will begin first by presenting the individual case studies and then present the group results.

Individual Case Studies

In this section I will present individual case studies for each of the members of the group, combining both qualitative and quantitative data. I will begin first by providing case study summaries for each of the participants and then will provide a detailed report for each of the participants.

I grouped the data into themes and groups of themes guided by my research questions. This resulted in 3 groups of themes:

1. Participation;
2. Programme impact; and
3. Attitude to programme.

A description of these is outlined below.

1. Participation,

Participation investigated the extent to which the individuals participated in the programme and what were the barriers to participation. This was divided into 3 themes:

- **Class** (classes participants attended and reasons for nonparticipation);
- **Homework** (homework completed and reasons for non-completion); and
- **Ongoing practice** (practice participants did once the programme was completed).

2. Programme impact.

Programme impact investigated the outcomes of the programme for each individual. This was divided into 6 themes:

- **Posture and balance**;
- **Ease of movement and function**;
- **Body awareness and movement strategies**;
- **Symptom control;** and
- **Knowledge and skills**;

3. Attitude to programme.

Attitude to programme investigated the participants' overall attitude to the programme. It was divided into 3 themes:

- **Personal value** (participants' general view of the programme);
- **Relevance to others** (participants' thoughts about the programme's relevance to others with SCI); and
- **Future considerations** (barriers to participation in the programme and recommendations for change).

Case study summaries.

In this section I will provide a case study summary for of each participant. This will be followed by a detailed report for each participant in the next section.

Participant 6.

Participant 6 was a New Zealand European wheelchair user in his 50s. He had an incomplete injury at T3/4 as a result of an accident in 2006. When he had his accident he also

suffered a head injury, the long-term effects of which had been night-time irritability and difficulties with getting to sleep, short term memory and concentration. He found it important to have a rest in the afternoon to manage these symptoms. He tended to have pain and sensitivity on his right side and his "bum" tended to get sore. He exercised regularly, meditated daily and was training for a marathon.

He had been to see me for a series of FIs about 10 years earlier and saw **Feldenkrais** as a way to cope with issues such as spasm and pain and to help with the ability to know where your limbs were. (He found it quite weird not knowing where they were). He hoped that the programme would enable him to better manage spasm, naturally rather than through medication. He also wanted to sit better. He had a scoliosis which had worsened and he felt very much shorter on his left side with his left leg feeling shorter. He stated that he could get into his wheelchair from the floor if he had another chair to lever himself.

Participant 6 attended seven classes. He reported sustained improvements in posture and balance (supported by his seated reach test totals); ease of movement and function; and body awareness and movement strategies. His body awareness tests suggest a marked increase in body awareness. One of the most memorable lessons for him was the pelvic rock which had made a huge difference to the way he wheeled his chair. Although he didn't mention it, I observed in the videos that in the first week he had difficulty into the wheelchair from the floor and needed help from two assistants. By the end of the programme he was getting into his wheelchair unassisted.

He felt that he was more able to manage his spasticity and that the programme had given him skills to improve his pain. The programme had made him generally feel better (which influenced his relationship to others) and given him confidence to try new things such as lifting heavier weights.

He found the programme beneficial and enjoyable and was interested in doing it again. He thought that the programme would be valuable for other wheelchair users, ACC should fund it and it should be part of SCI rehabilitation. However, he felt that a barrier to others doing the programme was the requirement to get on and off the floor.

Participant 7.

Participant 7 was a wheelchair user in her 50s. She could stand for a short length of time and walk with crutches for short distances. Her injury was as a result of a spinal arteriovenous malformation (AVM – an abnormal tangle of blood vessels on, in or near the spinal cord which can permanently damage the spinal cord) in 1990 and had been diagnosed as a T12 incomplete injury. She worked part-time in an office. She exercised sporadically - hand cycling and walking with crutches - and read for relaxation.

She had never heard of the **Feldenkrais Method** before hearing of my research. All she knew about the method was what she had read on the information sheet I sent her. She hoped that, by taking part in the programme, she could learn to reduce pain by improving her posture and learning to move better. She thought it would be nice to be part of it and see if it benefited her. She also wanted to help me with my research. She had no need of help getting into her wheelchair from the floor and there were no issues of accessibility for her apart from the fact that bladder control could be an issue.

Participant 7 attended six classes. She reported sustained improvements in balance (supported by her seated reach test totals); ease of movement and function (supported by her perceived exertion in movement and function totals); and body awareness and movement strategies. Her body awareness tests suggest a marked increase in body awareness. Lessons that really stood out for her were the breathing lesson and the lesson on rotation which had had a

"huge impact" and assisted her with activities such as rolling. She felt that the programme helped with her management of spasticity and had made her think more about the way she moved.

She found the programme "fantastic" and enjoyable although it required more commitment than she realised. She planned to continue using what she had learnt, perhaps attending future classes. She thought that it should be part of SCI rehabilitation.

Participant 8.

Participant 8 was a New Zealand European woman in her 50s. She had suffered nerve damage as a result of Guillain–Barré Syndrome (a disorder in which the body's immune system attacks the nerves paralyzing the whole body) in 2009. Although this is not an SCI, I included her because I was unable to find five volunteers with SCI and her doctor confirmed that the effect of Guillain–Barré on function was similar to that of SCI**.** She also had fibromyalgia and was able to walk but not comfortably. She tended to get a little bit of spasm at night and she had significant pain. Although her tendency was to exercise regularly, this had been compromised by illness.

She had heard the word "**Feldenkrais**" before but didn't know what it was. She was curious about the method and wanted to find out if it would help with her pain, fatigue and mobility. She also thought that it was good to help people doing important research on a health issue. Difficulty sitting still for long periods of time and fatigue could impact on her ability to attend.

Participant 8 attended seven classes. She reported sustained improvements in posture and balance (supported by her seated reach test totals); ease of movement and function (supported by her perceived exertion in movement and function totals), and body awareness and movement strategies. One of the biggest changes for her was the ability to roll over in bed. She found the

lessons relaxing and noticed a decrease in pain after the lessons. In Week 6 this decrease was dramatic - “like magic”. This decrease in pain is supported by her average worst pain intensity and pain interference totals. She felt that the programme had given her confidence in her ability to manage her symptoms. She had learnt a lot about movement and that there were different options available to her.

She found the programme very beneficial and informative; a “complete mind shift” although she felt that I could have done more each week to reinforce their learning. She intended to keep practising the **Feldenkrais Method** and thought it would be of benefit to others as well as the participants.

Participant 9.

Participant 9 was an African wheelchair user in his 30s. He had an incomplete injury at C7 as a result of an accident in 2013. He had spasm in his lower back and legs which was sometimes strong enough to throw him out of his wheelchair. He had to hold the wheelchair to prevent this happening (Week 10). He found that activity helped release spasm. He had his own business and had young children and exercised daily.

He had never heard of **Feldenkrais** and was taking part in the research because he wanted to learn more ideas and share ideas. He didn’t have huge expectations but still wanted to give it a go: “whatever you get, you are still making an effort”. He advised me that he would need help getting into his wheelchair during the study and had physical difficulties with writing. However he did not think that completing the online tests would be a problem as he was able to use the computer.

Participant 9 attended seven classes. He reported sustained improvements in posture and balance (supported by his seated reach test totals) and improvement in ease of movement after

some of the lessons. His perceived exertion in movement totals indicate a steady decrease in perceived exertion. He also noticed changes in some of his movement strategies, the most significant of which was that he learned to get into his wheelchair from the floor. He felt that he had learnt a lot from the programme and was able to apply some of what he learned at home and gradually improve.

He found the programme helpful and thought that he would continue to use what he had learnt on the programme. He thought he might also be interested in attending the programme again.

Participant 10.

Participant 10 was a New Zealand European man in his 50s with a T11/12 incomplete injury as a result of an accident in 1980. He was able to walk with the use of callipers and crutches. Although he sometimes experienced spasticity when sitting, generally he did not get a lot of spasticity. He was self-employed and exercised sporadically. After his accident he did horse riding which got him out of his wheelchair and onto crutches. Apart from that he hadn't really done any other programmes to restore his functioning. He just got on with his life.

> I tend to try and be as able bodied as possible and just being on crutches and I snow-ski, I sail, I do all these activities, and they tend to tire me out and keep me quite fit. I live in a 2-storey house and either walk upstairs or sometimes crawl upstairs, and that sort of always been my exercise and so I've never done anything more (follow-up interview).

He hadn't done any other explorations as he had been busy and what was on offer was mainly strength training. He didn't feel that was what he needed and he was already tired from walking (Week 10). "I didn't think mainstream just going to the gym and sweating it out was

ever going to do anything for me because you do that at Burwood and you get so far and it's not really doing anything, so you sort of then go, OK" (follow-up interview).

He had never heard of **Feldenkrais** before hearing of my research in a community newspaper.

> It interested me and having kids and stuff like that, you always sit there go it would be nice to be able to do a bit more with them and stuff like that, and so it just appealed…I think it was the fact that it had achieved some results and things like that, and it had beneficially affected some people with spinal cord injuries (follow-up interview).

In my initial discussions with Participant 10, he thought the programme could help with his walking. In his preliminary interview he said he was not sure what he hoped to get out of the programme – perhaps improved balance and better well-being. He had no special needs in terms of accessing the programme.

Participant 10 attended seven classes. He reported sustained improvements in posture and balance (supported by his seated reach test totals); subtle changes in movement strategies and improvements in ease of movement after some of the lesson. His body awareness tests suggests some increase in body awareness. He felt that his pain and fatigue had decreased over the course of the programme, that the programme had taught him to approach things differently - finding easier ways to move - and given him more control over his condition. This increase in control is supported by his IPQ totals.

He found the programme educational and enjoyable and thought that he would continue using the **Feldenkrais Method** in the future. However he would like to see more lessons that address his standing balance and walking. He thought that the programme would be valuable for

others with SCI; it enables you to recognise that you have more potential than you think. However he thought that the group's needs were diverse and it would be useful in future to work with a group with a narrower range of needs so that their specific needs could be met.

Detailed report.

In this section I will provide more details of the findings for each participant. For each participant this will be divided into Participation, Programme impact and Attitude to programme

Participant 6.

Participation.

Figure 7 illustrates which classes Participant 6 attended and his reasons for absence. He regretted missing the last class; in Week 11 he told me that he wished that he was coming back for the final week and in his follow-up interview stated that he was "disappointed I missed the last one".

1	2	3	4	5	6	7	8	9	10	11	12
		Infection				Personal crisis		Class cancelled	Personal commitment		Overseas

Key:
Present

Figure 7. Participant 6 - dates of attendance and reasons for absence

Figure 8 illustrates which of the online homework he accessed during the programme. He didn't tend to access the online homework and he wasn't aware that there was online homework until Week 4. The only online lesson he accessed during the programme was in Week 6. As he was starting a new business plus training for a marathon and with his head injury, he struggled to find the time and energy to do it "I had suffered a head injury and I get really tired by the end of the day" (follow-up interview). However in his follow-up interview he expressed regret at not doing more homework "there's always hindsight, and I wish I had probably put more effort into

doing that…I wish I had done more" and said that, if it had been requirement for the programme, he would have done it.

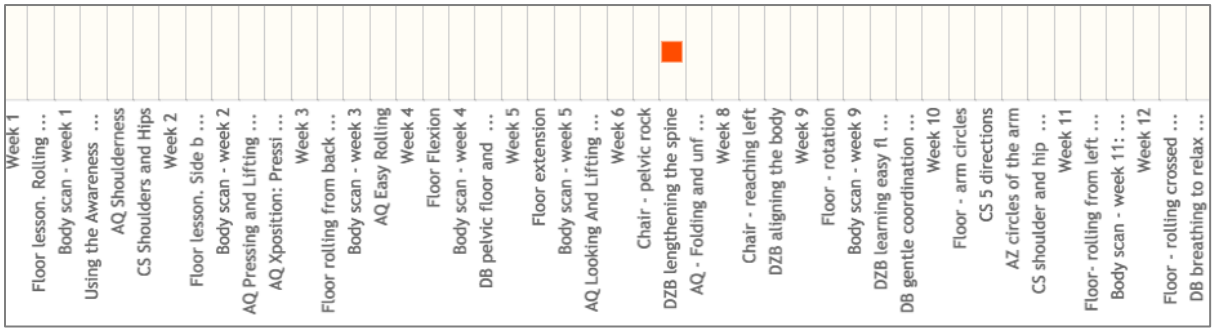


Figure 8. Participant 6 – online homework files accessed during the programme - 21 August to 6 November

Despite this, by Week 5 he was doing body scans every morning when he woke up. He found that, with practice, this was becoming easier. After completing the programme, he had continued to do the body scans which he found "certainly helps" (follow-up interview).

Maintaining practice was valuable but required discipline. "The hardest thing is to keep it going", "I think it's, it's that mental check to make sure you, you know, you haven't got the course to come to every week, just sort of as a reminder", "it'd be disappointing to have gone, go through that for 12 weeks and then let it all go" (follow-up interview).

Programme impact.

Posture and balance.

Participant 6 noticed improvements in posture and balance with increased range of movement during class. For example, he commented that he could move or reach further at the end of the ATMs in Week 1 ("I can go further"), 2, 5 ("I can certainly go back further") and 8. In Week 6 he noticed improvements in his ability to roll forward and back in his chair and he commented on improvements in his posture after the ATMs in Week 6 ("I seem to be sitting more erect and it's not because I'm putting my shoulders back. I normally sort of push the shoulders

back but now it's the fact that you are actually the hips [rotation in the hips]", "I'm not slumped as I usually am") and Week 8 ("I feel like I'm a little straighter"). These improvements were maintained on the drive home after the sessions: "I noticed like…driving home…my postures better…I'm sitting a bit better" (Week 4).

He found that some of these postural changes were sustained. For example, in Week 11, he told me that he had developed more control of the middle of himself and at one month follow-up he said "I've probably got a better idea of balance" (follow-up interview).

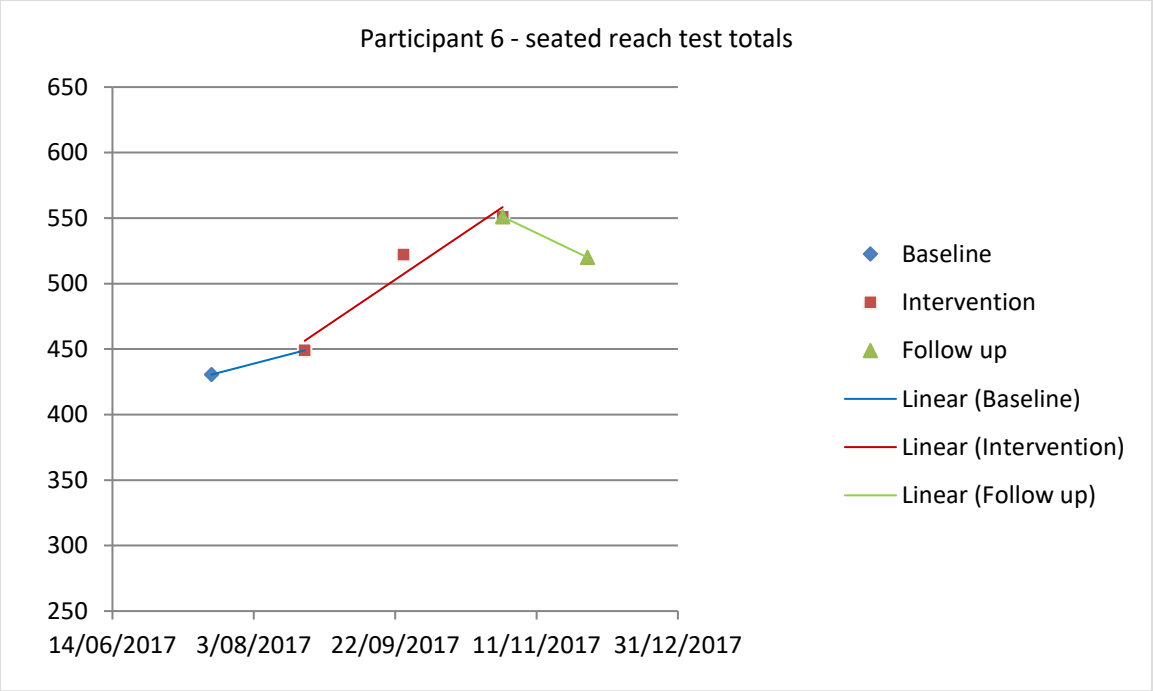


Figure 9. Graph illustrating Participant 6's seated reach test totals

The trendline through the intervention data points in Figure 9 supports Participant 6's subjective experience of improved balance. His final reach totals showed a marked improvement between baseline and Week 6 with continued improvement at the end of the intervention. Although his results dropped a little at one month follow-up, they still exceeded his baseline measures. He was "impressed with the increase in reach" (Week 8).

Ease of movement and function.

Throughout the programme he noticed improved ease of movement during class. For example, he commented that found the reference movements easier after the ATM's in Weeks 4, 6 ("yeah looking ups a lot easier", "hugely different"), 8 and 11 ("frighteningly easy"). He found that some of the changes were sustained throughout the week during the programme. For example, in Week 4 we did a lesson on breathing and bending forward. During the following week he noticed that he found it easier to bend forward. For example, at the gym he had found that bending and picking up basketballs had become easier: "It used to be a bit of a struggle….It has become easier since last week" (Week 5). In Week 8 he found that his wheeling time had improved and that wheeling had become easier: "I find using the wheelchair a lot easier now, going up ramps and stuff…Before it was all sort of arms and shoulders". At one month follow-up he had sustained improved ease of movement and function: "Oh it's certainly freeing…picking stuff up from the front is a lot better than it was before" (follow-up interview).

The trend line through the intervention data in Figure 10 suggests that his perceived exertion did not improve during the programme. However, in his follow-up interview he stated that the test results didn't fully reflect his experience which he attributed to the way he completed them. He felt that function had got easier and that the discrepancy may have been due to the way he completed the tests. He felt that he didn't mark himself hard enough at the beginning. This discrepancy could have also been in part because other commitments meant that the he struggled to remember to do the tests. At one point he entered the results for several weeks at the same time. He had noted them down earlier but not entered them until Week 11.

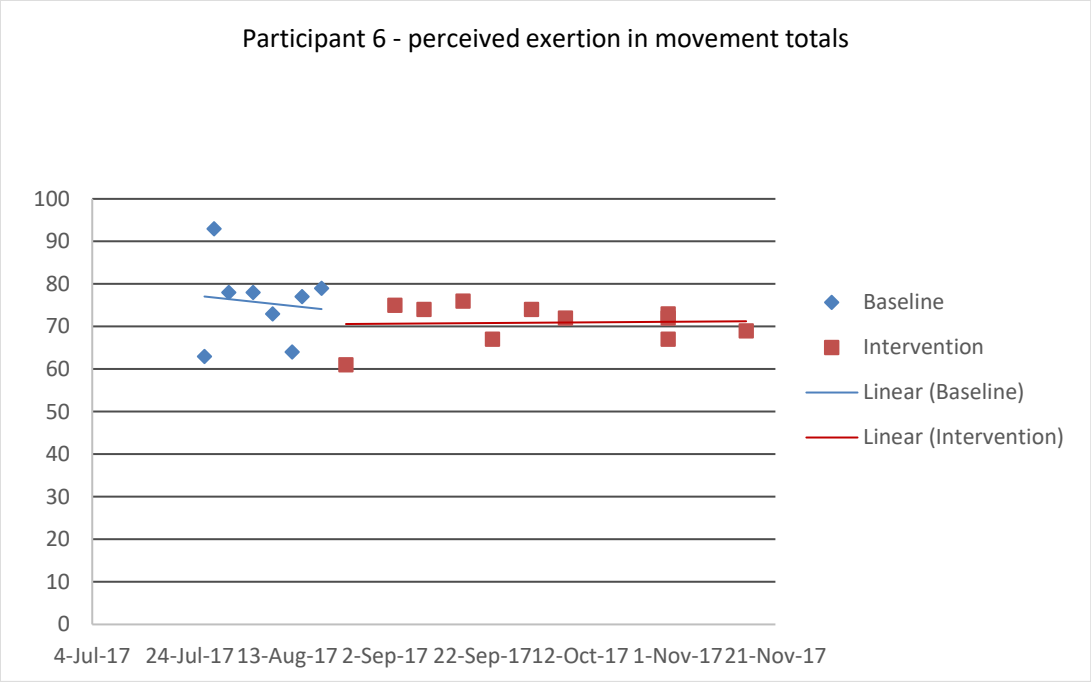


Figure 10. Graph illustrating Participants 6's perceived exertion in movement totals

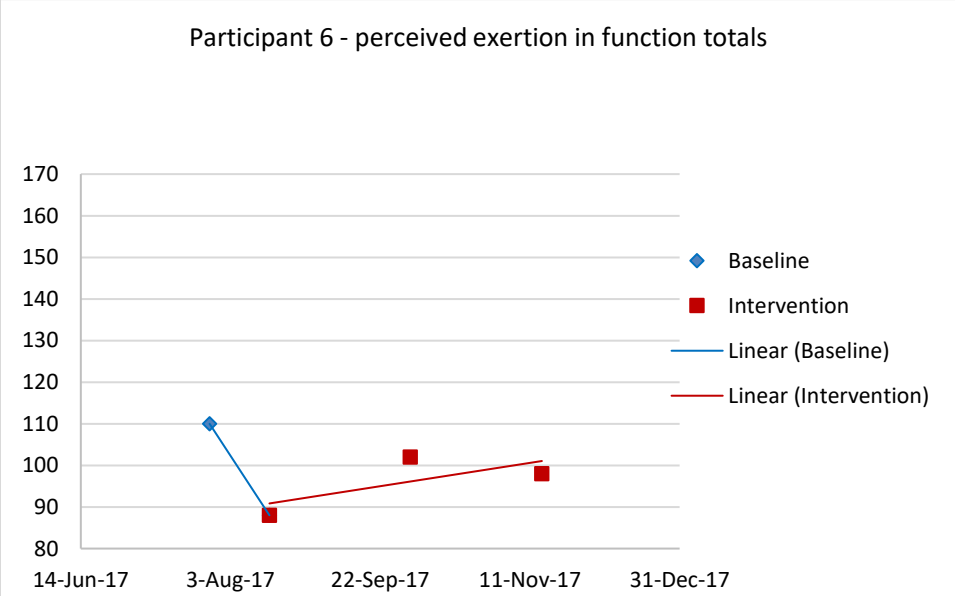


Figure 11. Graph illustrating Participants 6's perceived exertion in function totals

Body awareness and movement strategies.

He also observed changes in his body awareness after the ATMs. For example, after the ATM in Week 5 he could feel more of himself involved in movement and was more aware of the

curvature in his spine, in Week 6 he could feel more of himself involved in movement, in Week 8 he commented "I can feel the sitting bones more than I could before" and in Week 11 he told me that he had developed more awareness of the middle of himself during the course of the programme.

He found that his body awareness was improving both above and below his injury level with the use of the body scans:

> I've become more aware of the sections of my body, definitely above the injury level and I've probably dropped a little bit at the front here…there's a bit more of an awareness to utilise what I have. I mean, further down, like with my legs (follow-up interview).

However he found that he was having ongoing issues with sensing his right leg:

> I can't do anything with my right leg. I can't work out where it is or how to utilise, even when I do my body scan, there's nothing there…when I do it I know it's there, but if I try and utilise any part of it nothing happens (follow-up interview).

He also observed changes in his movement strategies after the ATMs For example in Week 2 he found that he was using his pelvis more. Some of the changes in strategies were sustained between classes and at follow-up. For example, in Week 6 he commented that he had become more aware of using his breath. "I find at the gym now I do utilise you know the breathing". and at one-month follow-up he stated:

> it's certainly made me a lot more aware of things that are going on…you tend to use a lot more of the body, muscles…I think you also do less with more, like. Instead of just moving some, one area, you actually probably incorporate [more parts].

For Participant 6, one of the most memorable lessons seemed to be the pelvic rock in the chair lesson (Week 6). In this lesson I got them to experience how using the pelvis to help with pushing the wheelchair was more efficient than just using the shoulders and arms. He referred to the benefits he got from this lesson several times throughout the programme. He found that it made a “huge difference” to the way he wheeled his wheelchair. He was using more of his pelvic area and less of his arms and shoulders to and was going faster: “getting a better drive with the push” (follow-up interview).

One of the changes that I observed in the videos that he didn’t mention in the interview was how his strategy changed for getting back into the wheelchair at the end of each lesson. In the first week he had difficulty getting back into the wheelchair at the end of the lesson, even with the help of another chair to lever him. He needed one assistant to lift him while the other held the wheelchair. However, in subsequent lessons he used the box that I had provided and was able to get into the wheelchair unassisted.

It appeared from Participant 6’s body awareness tests that he became more aware of more parts of himself being involved in the test movement, including the right leg and other areas below the injury level. In the preliminary interview he stated that he could feel his “arm, hand, left side” involved in the movement. In the follow-up interview he stated that he could feel “the arm, and then it’s both the left and right trunk, shoulders, neck, that’s all sort of part of the balance, hips and right leg”. By comparing Figure 12 and Figure 13 it is clear that he could feel much more of his body involved in the movement at follow-up.

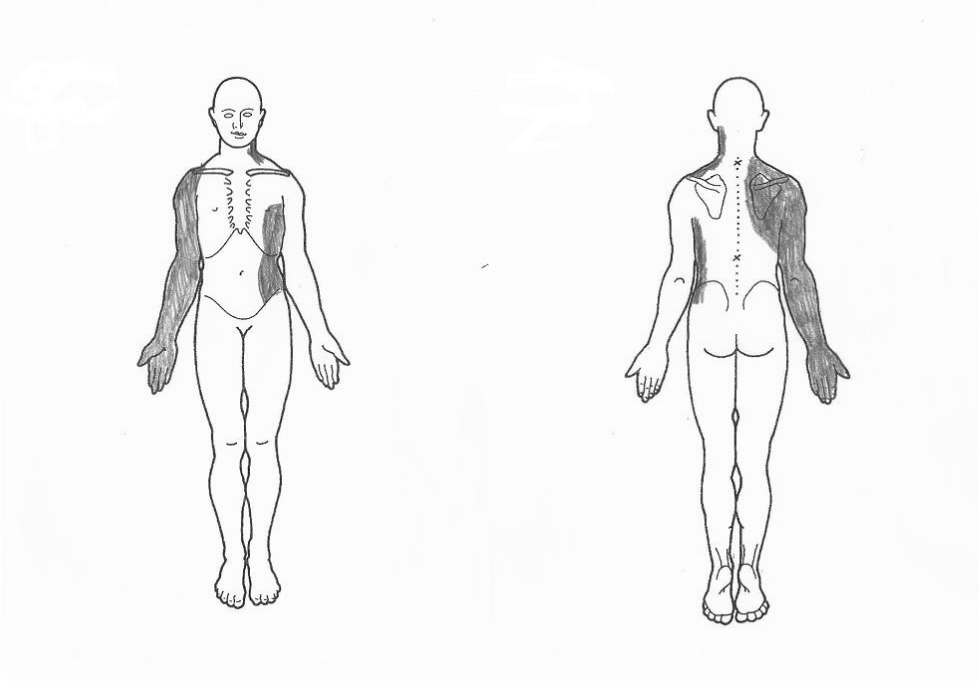


Figure 12. Participant 6 - Pre-intervention body diagrams

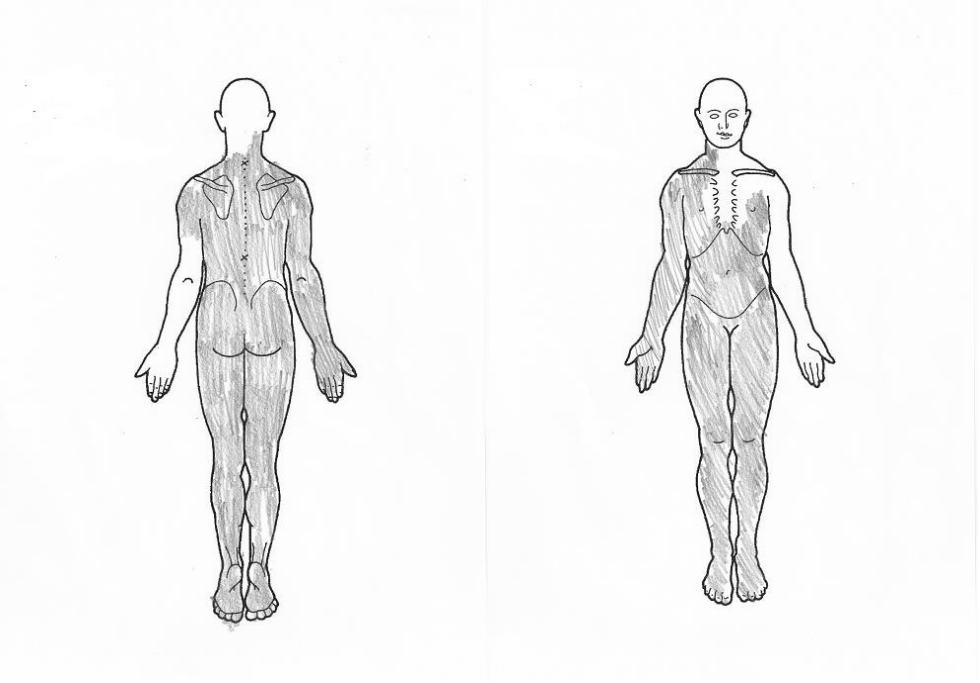


Figure 13. Participant 6 – 1-month follow-up body diagrams

Symptom control.

Participant 6 found that the lessons helped somewhat with spasm. Initially in Week 1 he found that the lesson increased his spasm but at the end of the Week 2 ATM he reported that he had less spasm as result of the lesson. By Week 8 he said that that his spasm had "probably been a little less onerous" and at one-month follow-up he reported that he thought he was handling his spasms better and was not having to use as much baclofen (antispasmodic medication).

> I find that I'm using that less. I don't think the number of spasms, or the frequency of spasms, or even probably the strength of spasm has got any better, but I suppose I'm handling it…I'm learning how to cope with it a little better than they were. I still get the odd really, really bad day, but they're not as frequent as they were (follow-up interview).

He felt that managing the spasticity could improve his pain and that the **Feldenkrais** could help to spread the pain load across several different areas, thus assisting the overall tolerance of pain: "by utilising more muscle groups to do something, you actually spread that pain load across and instead of it being acute pain in one area it's probably a lesser pain over more" (follow-up interview).

Figure 14 illustrates a decrease in pain interference at the end of the programme compared to baseline, however as his pain interference results were so variable, this does not suggest that the decrease was as a result of the programme.

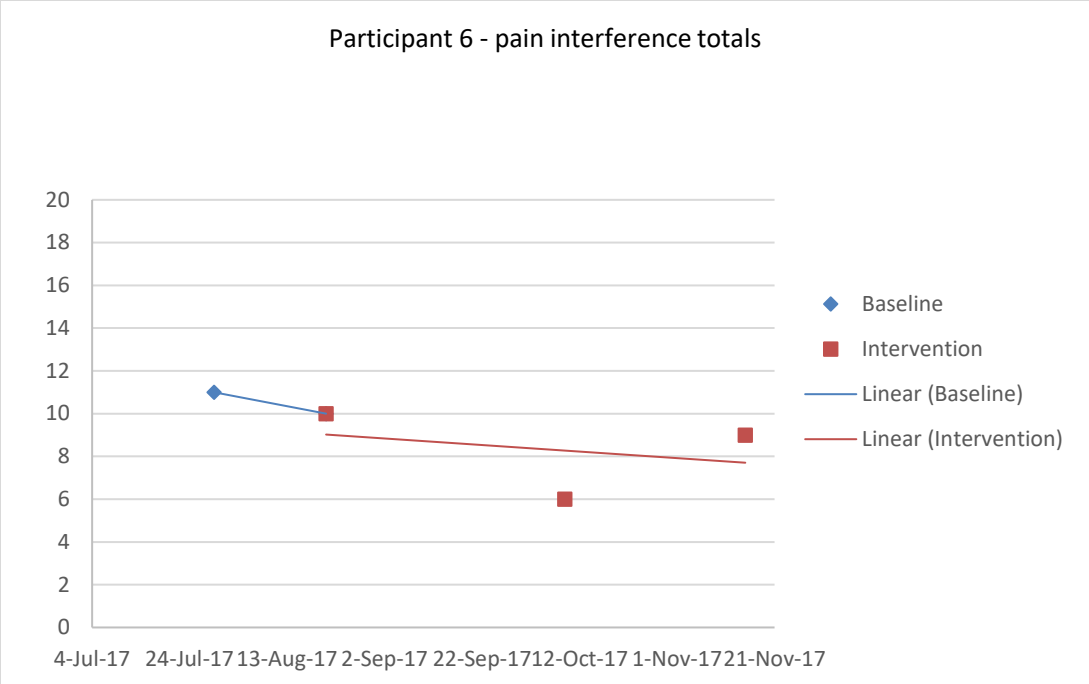


Figure 14. Graph illustrating Participant 6's pain interference totals

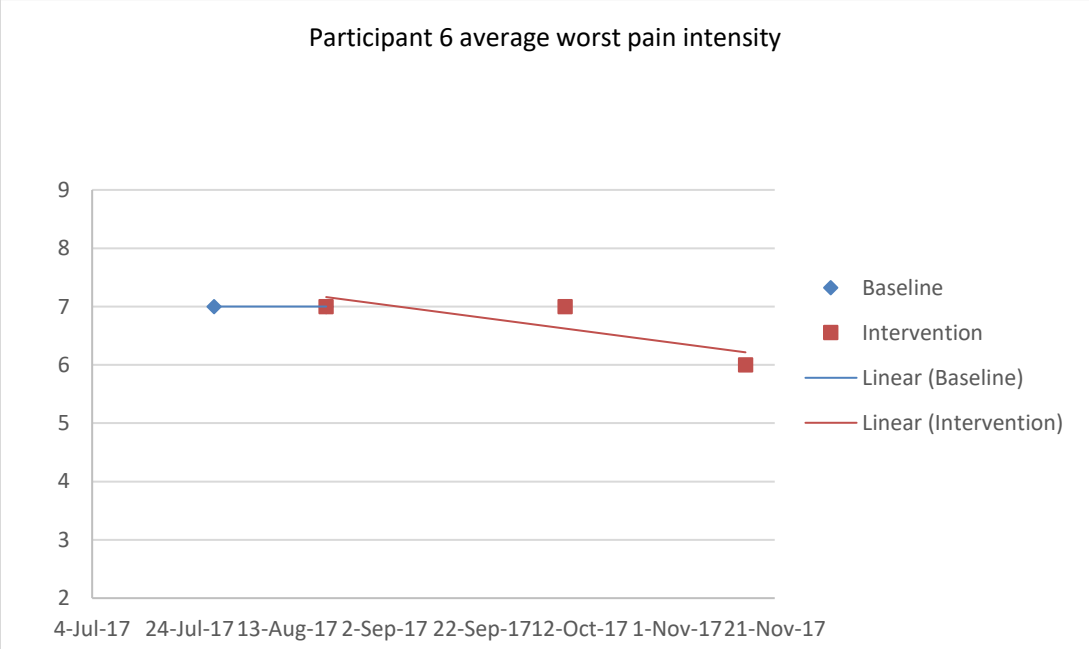


Figure 15. Graph illustrating Participant 6's average worst pain intensity

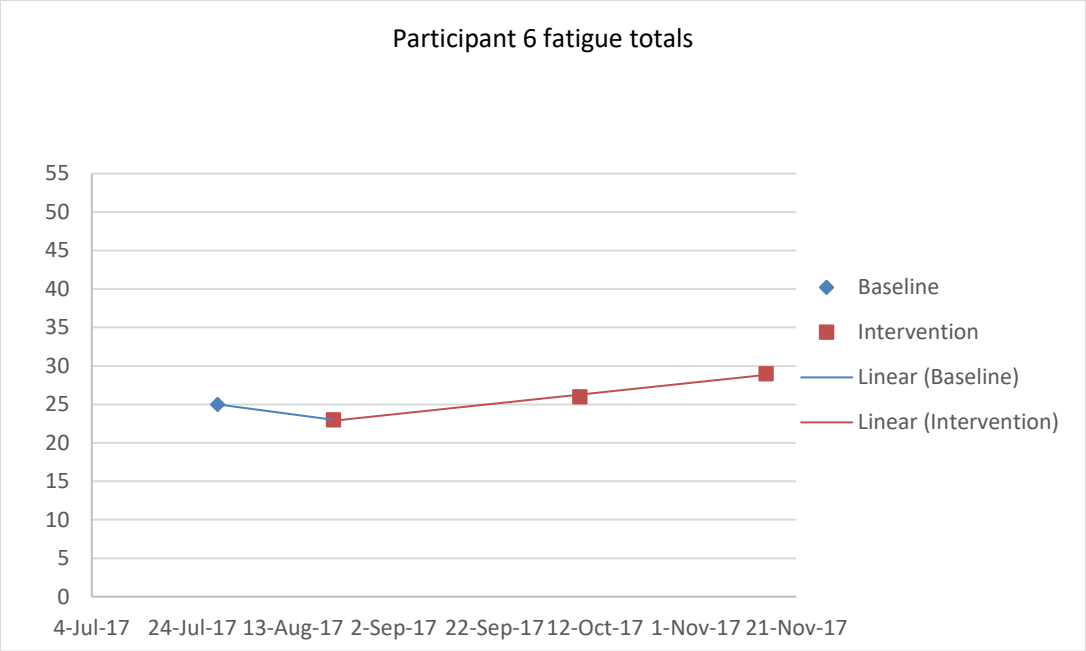


Figure 16. Graph illustrating Participant 6's fatigue totals

The fatigue results (Figure 16) illustrate an increase in fatigue during the programme. Although his IPQ results dropped in Week 6 they exceeded the baseline at the end of the intervention (see Figure 17).

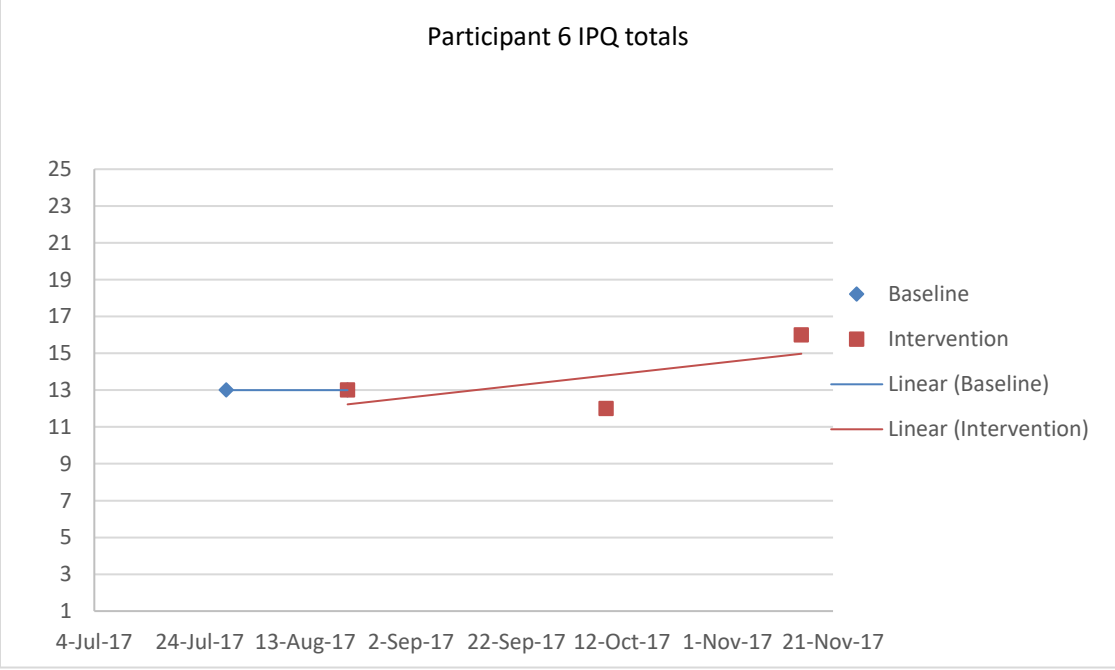


Figure 17. Graph illustrating Participant 6's IPQ totals

Knowledge and skills.

He attributed the changes to being forced to challenge the way you move and try different options rather than moving in the same habitual ways:

> it forces you to actually, think about what you're doing, rather than you just doing something…it's just learning, you're learning a better way, a better way to do stuff (follow-up interview).

He felt that the programme had given him "a bit more confidence to try things", for example "lifting stuff from in front of myself, like the big thing is, like washing basket, and I'll lift a probably heavier weight" (follow-up interview).

He felt also that the programme made him generally feel better which influenced his relationship to others and again influenced his confidence to try new things: "it makes you feel better, so, it's the old story – the better you feel, the better your outlook, the better you relate to others, and you try more things, be more successful" (follow-up interview). Participant 6 gave talks on motivation and understood the importance of breaking your goals down into achievable goals. He felt that what he'd learnt on the programme was a step towards a larger goal. His goal after his accident was "right I'm going to walk again" which he described as "way, way up there". He felt that breaking it down to "Well if I can get some feeling and some movement then…this is just another step on that journey". Even if he was never going to walk again he could still "maintain a certain muscular tone in my left leg" (follow-up interview).

Attitude to programme.

Personal value.

Overall Participant 6 found the programme "beneficial" and wouldn't mind trying it again. He also said that he really enjoyed the programme. Part of what made it enjoyable was my passion for the method and the way I taught ("your passion for the whole system, for the whole course, structure the way you do it. I think you're sort of a walking encyclopaedia of what the **Feldenkrais** can do that made it a little bit easier" (follow-up interview)) and "the interaction with a group…I don't do a huge amount with some of the spinal sort of programmes…to meet new people and with various ranges it was certainly good" (follow-up interview).

Despite not accessing the online homework frequently he found accessing the homework site was "all pretty self-explanatory and easy to get through" (follow-up interview). He intended to continue to incorporate the **Feldenkrais Method** into his life and was keen to maintain the changes that he had made on the course: "our normal has changed and we've gotta say…'Right, that's now my new normal, so I'm not gonna drop back I'm gonna maintain, work to maintain that'" (follow-up interview).

Relevance to others.

Participant 6 thought that my programme would be valuable for other wheelchair users. In his follow-up interview, he stated that "it's something everyone in a wheelchair should do". He had recommended it to other wheelchair users and intended to continue to recommend it. "I'm sure anyone that does the course will say that it's proved beneficial to them" (follow-up interview).

He thought that ACC should fund it and had mentioned it to his ACC support coordinator: "I said I've found it, worthwhile and it's certainly something that I think should be

considered. If it's gonna benefit people in their recovery, and cos at the end of the day ACC's job is to get your life back to as much as possible" (follow-up interview). He also felt that **Feldenkrais** should be incorporated into SCI rehabilitation "the incorporation of Feldenkrais into spinal cord rehabilitation would only be beneficial" (follow-up interview).

Future considerations.

He felt that one barrier for others doing the programme could be the requirement that people could get into their wheelchair from the floor. "The only thing, and I know it was a stipulation before we started, would be getting in and out of your chair, onto the floor … I wouldn't think too many of us get in and out of our chairs, not onto the floor anyway" (follow-up interview).

Participant 7.

Participation.

Figure 18 illustrates which classes Participant 7 attended and her reasons for absence. She missed Weeks 4 to 9 because of health complications and because she had to go overseas to help a family member who had been affected by natural disaster. Prior to the last class she told me that she felt sad, almost depressed that she had missed so many classes. "I feel like I missed some of the pointers and some of the pieces were missing cos I hadn't been there, so that was a negative for me. It was unfortunate" (follow-up interview).

1	2	3	4	5	6	7	8	9	10	11	12
			Had a fall and twisted knee	Not recovered from twisted knee	In hospital	Overseas helping family member		Class cancelled			

Key:
Present

Figure 18. Participant 7 - dates of attendance and reasons for absence

As shown in Figure 19 she accessed online homework for Weeks 1, 3, 4, 5, 10 and 11. In Week 2 she found herself too busy to do the online homework however "when I was in bed and couldn't sleep at night, I did think about what we'd done here". She was unable to access the online homework while overseas as she had no Internet access.

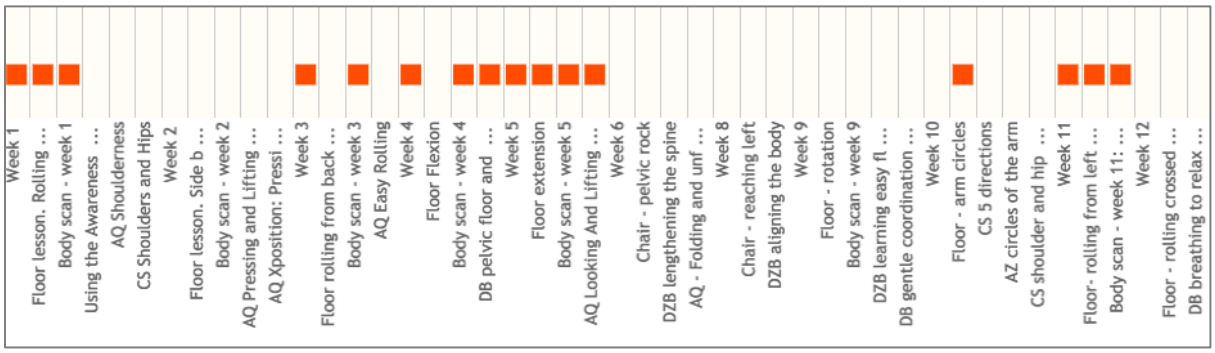


Figure 19. Participant 7- online homework files accessed during the programme - 21 August to 6 November

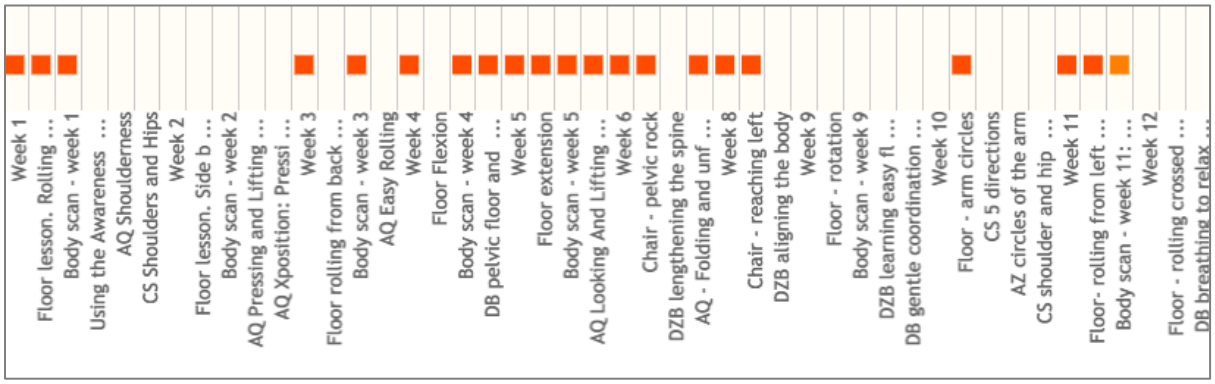


Figure 20. Participant 7 - homework files accessed 21 August 2017 to 1 February 2018

Figure 20 shows what online homework files she accessed from the beginning of the programme to three months after programme completion. At three-week follow-up she had continued to practise some of the online lessons, "not as much as I want, but yeah, I've done two or three I think". The busyness of life meant that practising could be a challenge.

> Yes, it's the same old thing isn't it, busyness of life…when I'm rushing, I don't think about it, so I need to slow down and think and that's the hard part, when you've got lots on, lots to do (follow-up interview).

However she had continued to use the skills that she had been taught on the programme. “It’s kind of part of life now, to a certain extent”, “yes I’m thinking about how I move and how I do things now” (follow-up interview).

Programme impact.

Posture and balance.

She found that her range of movement had increased after the ATMs in Weeks 3, 10, 11, and 12 suggesting improved balance. Improvements in balance are reflected in her seated reach totals (see Figure 21) which illustrate a relatively stable baseline and an improvement during the intervention. This improvement was maintained at three week follow-up.

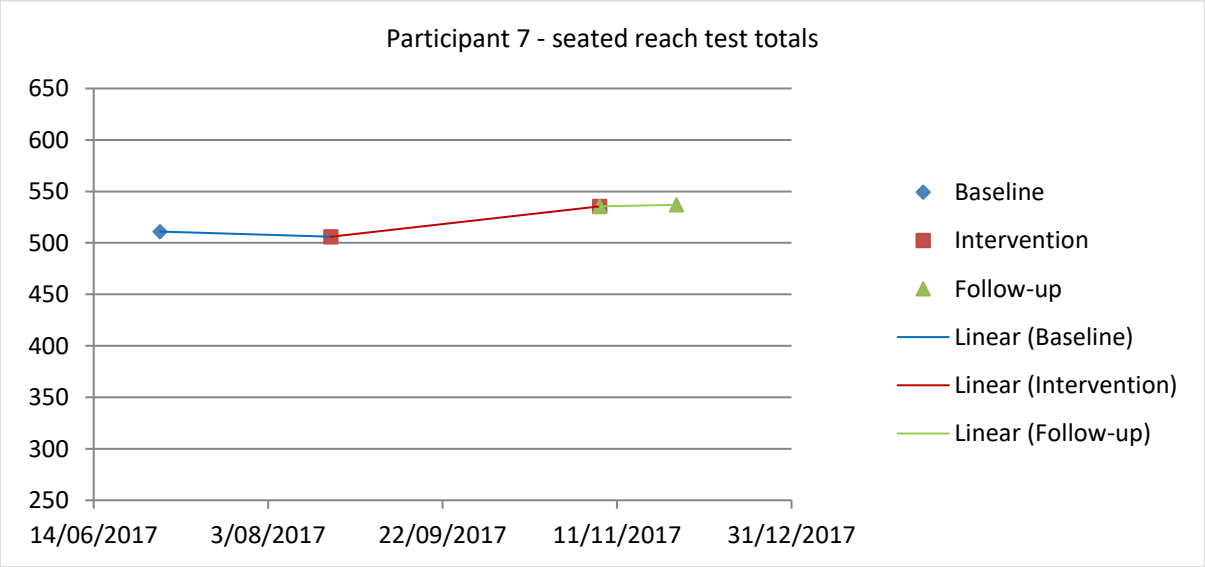


Figure 21. Graph illustrating Participants 7's seated reach totals

Ease of movement and function.

Throughout the programme Participant 7 noticed improved ease of movement after the ATM’s. For example, she noticed reference movements were easier after the ATMs in Weeks 1 (“My neck’s easier”), 2 (“I found it much looser” [pointing to her pelvis and waist]), 3 (“big difference”), 10, 11, and 12 (“yes I’m just looser all round”). In Week 10, during the arm circles

lesson, she was struggling to circle her arms because of pain in her shoulder. I showed her how allowing the ribs to open would give her freedom to move the arms. She described this learning in Week 11. Participant 10 had pointed out that turning the shoulder in the arm circles lesson was a struggle for him because of limitations in his movement causing muscle pain in the top of the shoulder. She commented "I was exactly the same… but as Cindy's saying, when I changed what I was trying to do rather than moving the arm but moving the body, the ribs, you're not using that muscle in that same movement and it makes it a lot easier".

She found that she had sustained the improved ease of movement outside of the lessons. In Week 12 she reported that there were "things that I can do more easily at this stage". She reiterated this at her three-week follow-up interview where she said that movement was definitely easier.

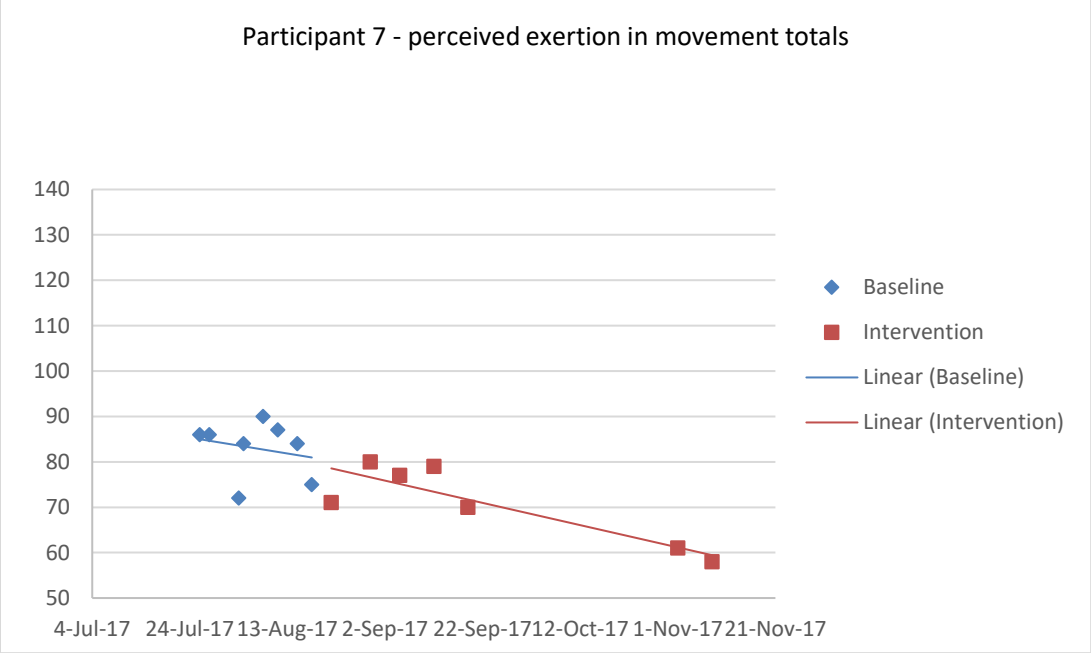


Figure 22. Graph illustrating Participants 7's perceived exertion in movement totals

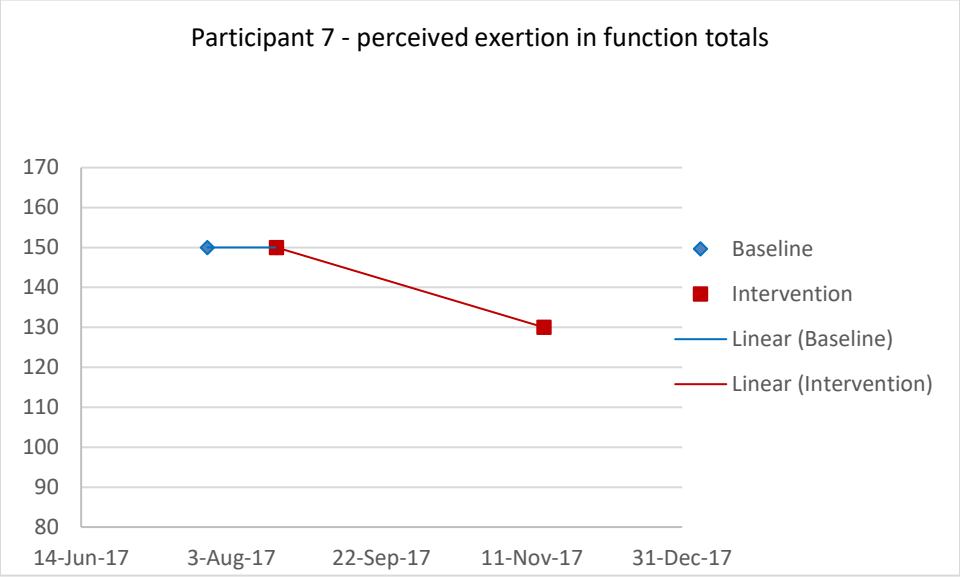


Figure 23. Graph illustrating Participants 7's perceived exertion in function totals

Improvements in ease of movement and function are also reflected in the results of her perceived exertion tests displayed in Figure 22 and Figure 23. Although there was some decrease in exertion in movement at baseline (suggesting that some learning was taking place as a result of practice) the rate of improvement increased during the intervention. The total perceived exertion in function was stable at baseline but had dropped 20 points by the end of the intervention.

Body awareness and movement strategies.

One lesson that really stood out for her was the lesson on rotation which had "a huge impact" on her: "I imagine when I'm rolling now I imagine that spiral, or any movement like that. That was a big, a big thing for me, that spiral movement" (follow-up interview).

Another significant lesson was the breathing lesson. She missed the class but completed it for homework. "One of the things that stood out for me one of the early ones was breathing. I notice I hold my breath when I try to do things; that's quite important to me" (Week 10).

She found that some of her learning was sustained at three-week follow-up. For example, "there's definitely more awareness of me, with the ribs…I'd never considered my ribs before. I'd never thought about them being part of movement…or even the other bones, the bones in your legs". She had also changed the way she climbed the stairs. "It's totally changed how I do that" by "just applying what I know, that it's not just lifting my foot up onto the step, you know, it's the whole movement". This was enhanced by the use of her imagination. "My right foot causes me problems, cos it flops down and so now I imagine me lifting, lifting the toe up as well as trying to physically do it, and I think that makes a difference" (follow-up interview). In an email to me one year later she reported that she was still aware of this.

It appeared from her body awareness test results that her body awareness had improved as she had become aware of more parts of herself, both above and below the lesion, being involved in the test movement. In the preliminary interview she stated that the "arm, brain, trunk" were involved in the movement. In the follow-up interview she stated that she could feel "the whole body…It's different, before I thought arms and trunk and head and eyes but now I can feel it, like right down even to my feet...During one of the lessons I said to you 'I push on that right foot now, so I think its whole thing'". By comparing Figure 24 and Figure 25 it is clear that she could feel much more of her body involved in the movement.

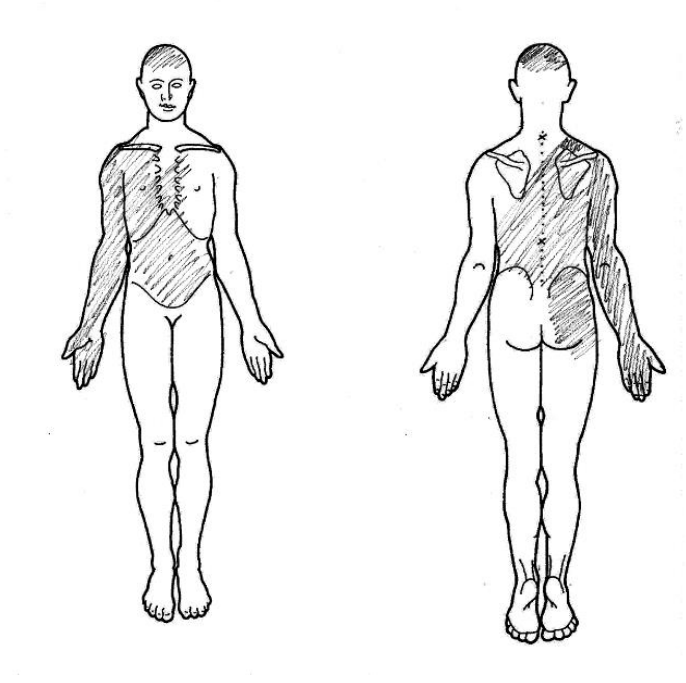


Figure 24. Participant 7 - Pre-intervention body diagrams

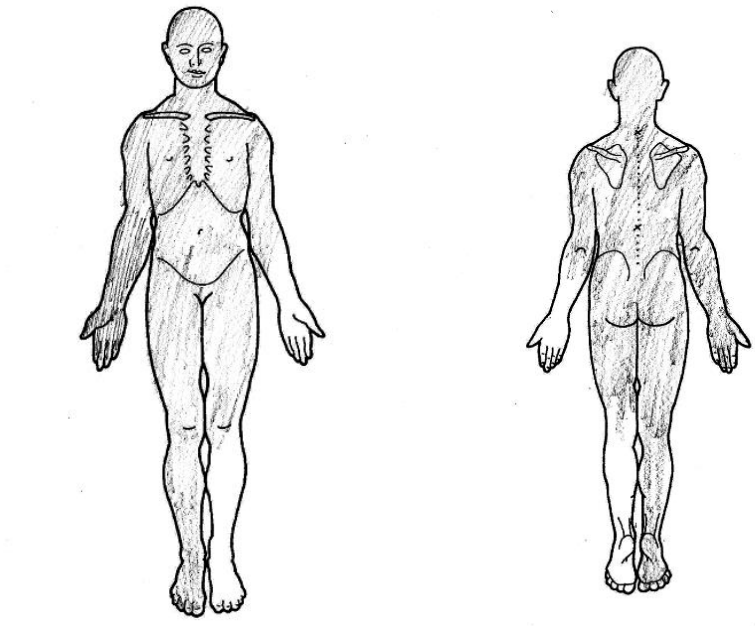


Figure 25. Participant 7 – 3-week follow-up body diagrams

Symptom control.

She found that the lessons assisted with the spasticity she experienced when she lay on her back. In Week 10 we explored how, for some people, opening the hip joint triggered spasm and that, by changing the way they did that, spasm could be reduced. In Week 11 she pointed out that that had been helpful for her and at follow-up she was still using this strategy and finding that it helped her reduce spasticity.

Although she noticed that the pain in her arm that came with reaching had gone after the Week 10 ATM, she felt that, generally, the programme did not have an impact on pain. However she pointed out that pain was not a major issue for her: "I haven't got a day when I don't think I'm going to get through the day because I've got so much pain, I don't have that much pain" (follow-up interview). The results of the pain questionnaires illustrate that the programme did not have a positive effect on her pain (see Figure 26 and Figure 27). Although there was a decrease in pain interference from the end of baseline to the end of the intervention, she had slightly less pain interference at the beginning of baseline than at the end of the intervention. Her average intensity worst pain increased at baseline and was maintained by the end of the intervention. It is noteworthy, however, that she had a fall and twisted her knee in Week 4. At baseline her worst pain was in her neck and/or shoulders whereas at the end of the programme her worst pain was in her lower leg. It is likely that her knee injury contributed to pain interference and the extent of her worst pain.

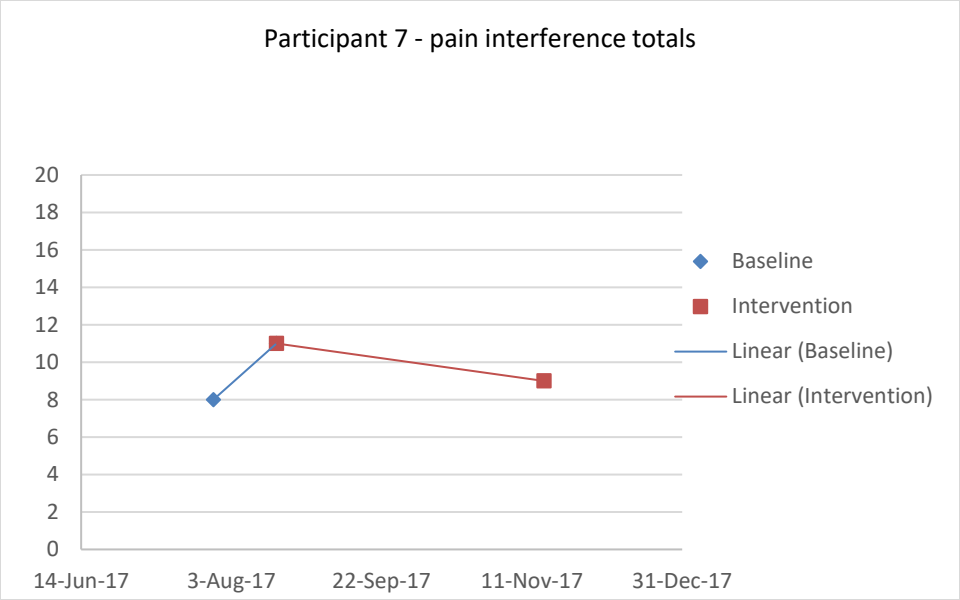


Figure 26. Graph illustrating Participant 7's pain interference totals

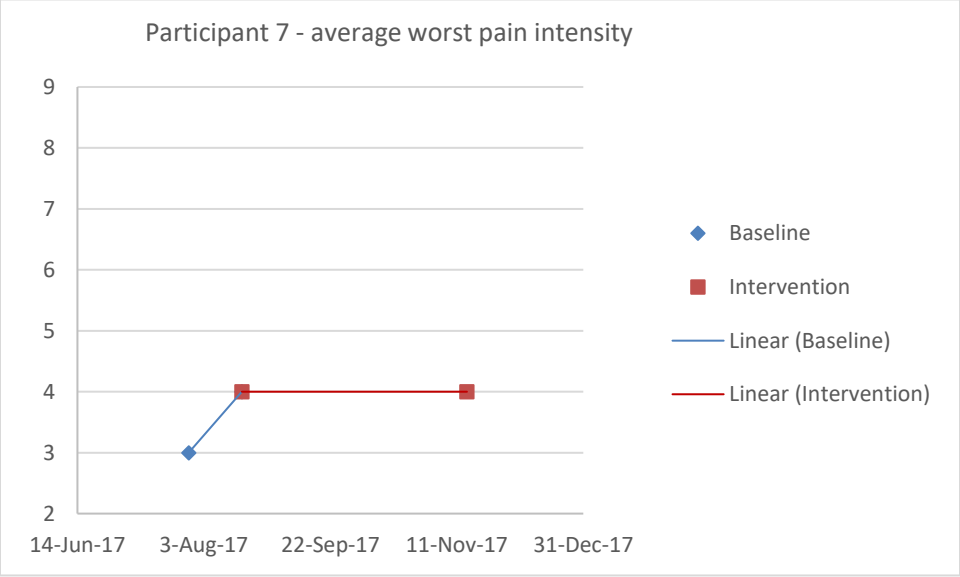


Figure 27. Graph showing Participant 7's average worst pain intensity

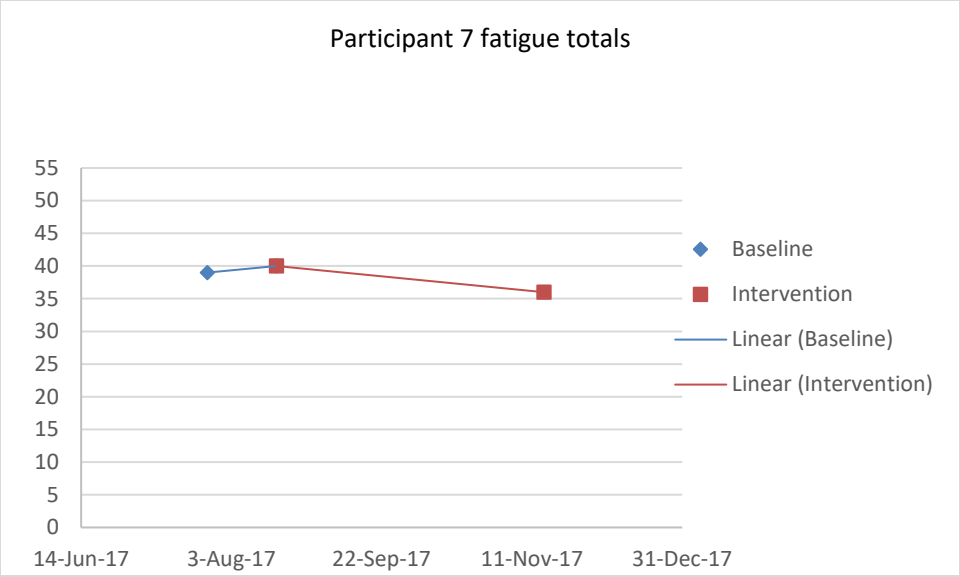


Figure 28. Graph illustrating Participant 7's fatigue totals

Her fatigue test results (Figure 28) indicate a slight increase at baseline and a four point decrease by the end of the intervention. However, as she indicated, her fatigue was variable and not too much could be drawn from the fatigue test results "because it was based on one week it could've been a good or a bad week, 'cos I get good and bad days" (follow-up interview).

She believed that the programme had changed her ability to control her symptoms with the exception of pain which was not really an issue for her. It is not clear whether her IPQ test results were influenced by the programme as, although there was an eight-point increase during the programme, there was a 10 point increase during baseline (see Figure 29).

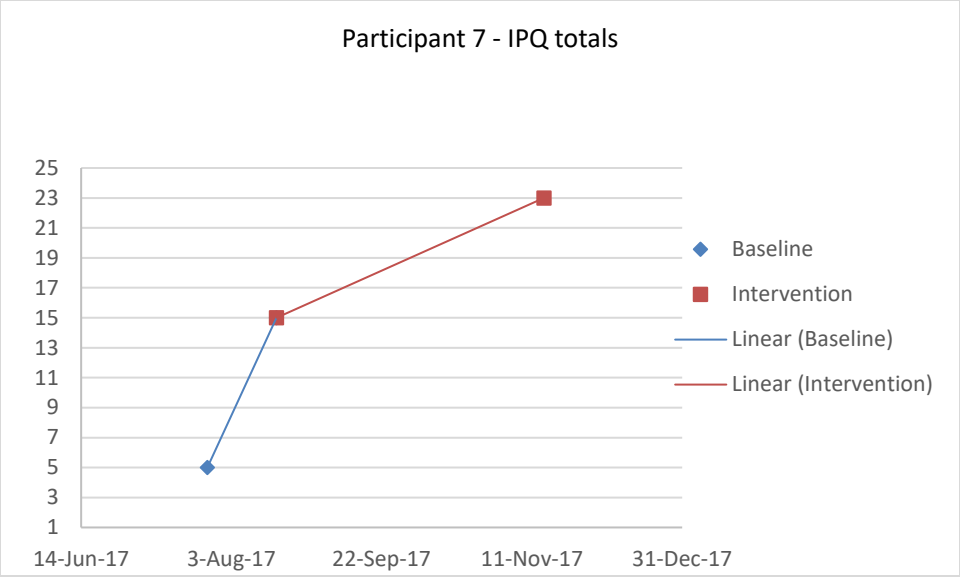


Figure 29. Graph illustrating Participant 7's IPQ totals

Knowledge and skills.

She found that the classes had "definitely" had an effect on her life. "They make me think more about how I move…there's far more to movement than you imagine…It involves a lot of your body for a single movement" (follow-up interview). One concept that really stood out for her was doing less than you can "Cos that goes against your natural instinct doesn't it. You push harder, whereas when you do less…" (follow-up interview).

Attitude to programme

Personal value.

Participant 7 said she thought the programme was "fantastic" and that she wished that she had known about it decades earlier. "I think it's great. I wish I'd known about it when I was paralysed in hospital"…"like I've been like this for 27 years now and so things, I've got habits and things that are hard to overcome. But I think that would've been so good to…have known about it" (follow-up interview).

Although she found that the busyness of her life made getting to classes difficult, once she got to class she enjoyed it "I think the barrier was myself, my busy life…once I was here it was great. It was actually a nice time…out of life" (follow-up interview).

She planned to continue using what she had learnt "I think I'll continue to use it and I think as my life gets less and less busy, as children grow up and move on, I'll have more time to actually think about it" (follow-up interview) and if the timing was right she might attend future classes.

She found the homework "very useful, because it reinforced the things that we'd learnt and heard" and the summary sheet a good "synopsis". The body scans were useful for restoring body awareness but she found it difficult to concentrate on them "Cos I found myself drifting away sometimes". She found that doing the homework was "not the same as being there" and getting real benefit required more commitment than she had anticipated. However she acknowledged that, as this was a course on movement, one would expect to have to practise.

Relevance to others.

She thought it would be good to see the programme as part of the Burwood Spinal Unit rehabilitation.

> I think it would be brilliant if it was at Burwood. You know, all those people trying to get to terms with it, it's a mental, a positive mental aspect that you can deal with when you're lying there wondering about how the future's going to be and what can you do and you can't do, to be able to start thinking, I can imagine this and try and get movement going, like it's a positive side for people…it would be great if they would embrace it out there (follow-up interview).

Future considerations.

One issue for her was the room size which she felt was not big enough for five people. "That week you had everyone there, the room was too small, I felt, we were kind of bumping into each other and that was the only downside I think" (follow-up interview).

Participant 8.

Participation.

Figure 30 illustrates which classes Participant 8 attended and her reasons for absence. For her the barriers to participation were travel time (it was a 45 minute drive) and her injuries and illness "I had a surgery on my hand in the middle of the course, and then I fell down the stairs and sprained my ankle…depending on how my fibromyalgia was at the time, on any given day, could be a bit of a hindrance sometimes" (follow-up interview).

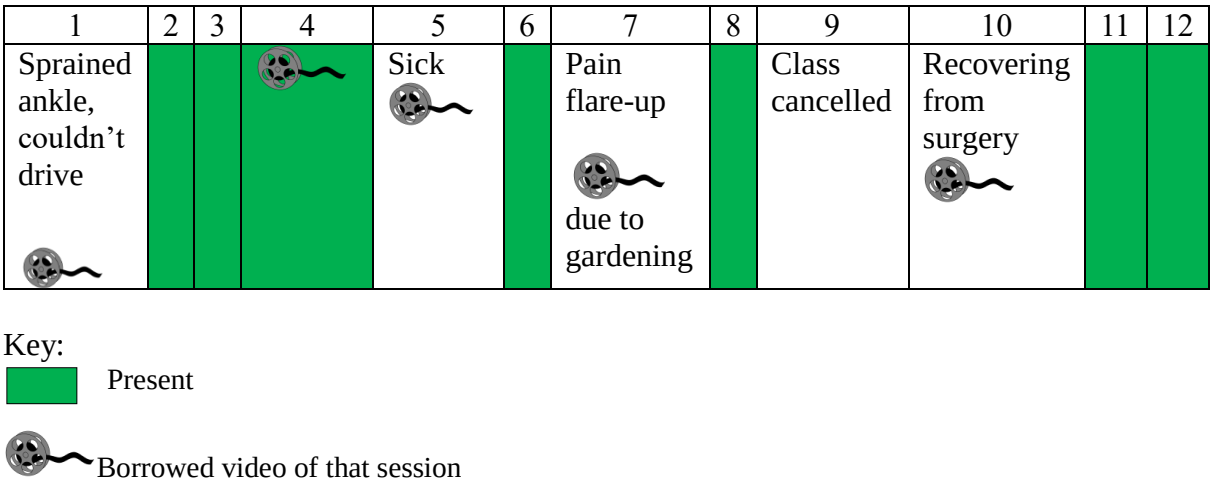


Figure 30. Participant 8 - dates of attendance and reasons for absence

As shown in Figure 31, by the end of the programme she had accessed homework for every week of the programme except Week 9. At times she didn't manage to do the homework because she ran out of time or forgot. Even if she didn't find time to do the online homework, she took time to reflect on the lessons. For example, in Week 3 she said that when she started

doing the body scan she thought that it was going to be 30 minutes and decided she didn't have the time. Instead "I thought about my ribs".

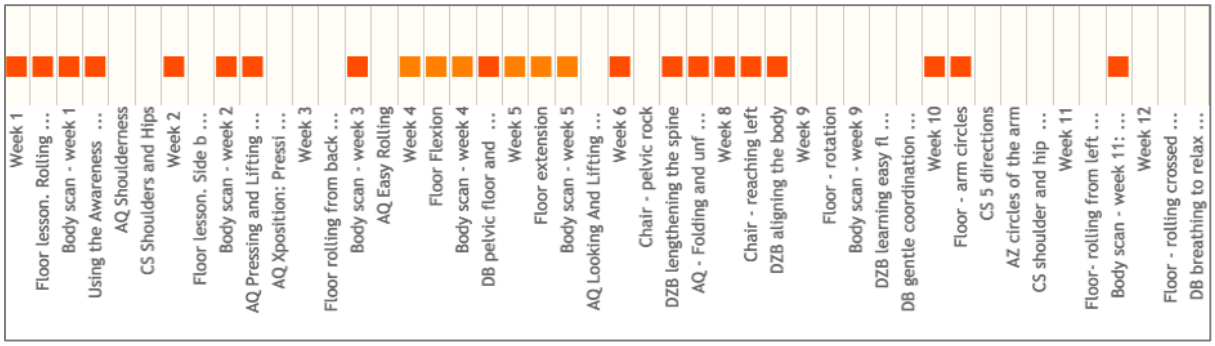


Figure 31. Participant 8- online homework files accessed during the programme - 21 August to 6 November

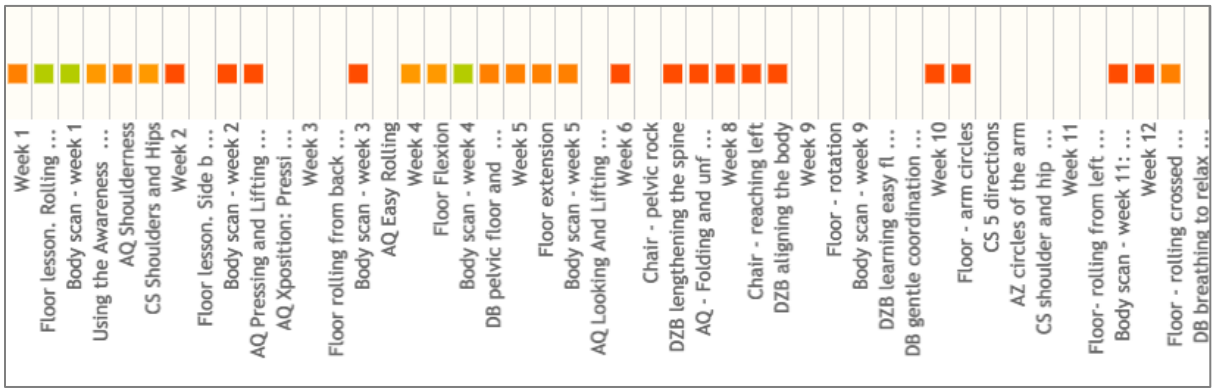


Figure 32. Participant 8 - homework files accessed 21 August 2017 to 1 February 2018

As shown in Figure 32, she practised more homework at programme completion. However, at three month follow-up she commented that she hadn't been practising the lessons as much as she would have liked to have as she had to go into hospital for surgery and had had health problems.

Programme impact.

Posture and balance.

She noticed differences in posture and balance after the ATMs. For example, in Week 4 she noticed when driving home that her posture was better, in Week 6 she felt more balanced in

sitting “I feel like straighter and more balanced…I feel more upright” and walking “I feel a bit more steady” and in Week 8 she felt that her posture had improved “yeah I felt my posture was better”. She also noticed after the ATMs in Week 2, 3 and 8 that she could reach further.

Improvements in balance are also supported by seated reach test scores (see Figure 33) which illustrated a decrease at baseline and a marked increase during the intervention which was maintained at three-month follow-up. However her total reach scores at three month follow-up illustrated that, although her reach scores were still an improvement on her baseline reach scores, they had dropped a little from the end of the intervention. She felt this was obviously due to her hospitalisation and health issues but thought that the fact that she was still achieving close to the post-intervention levels was significant.

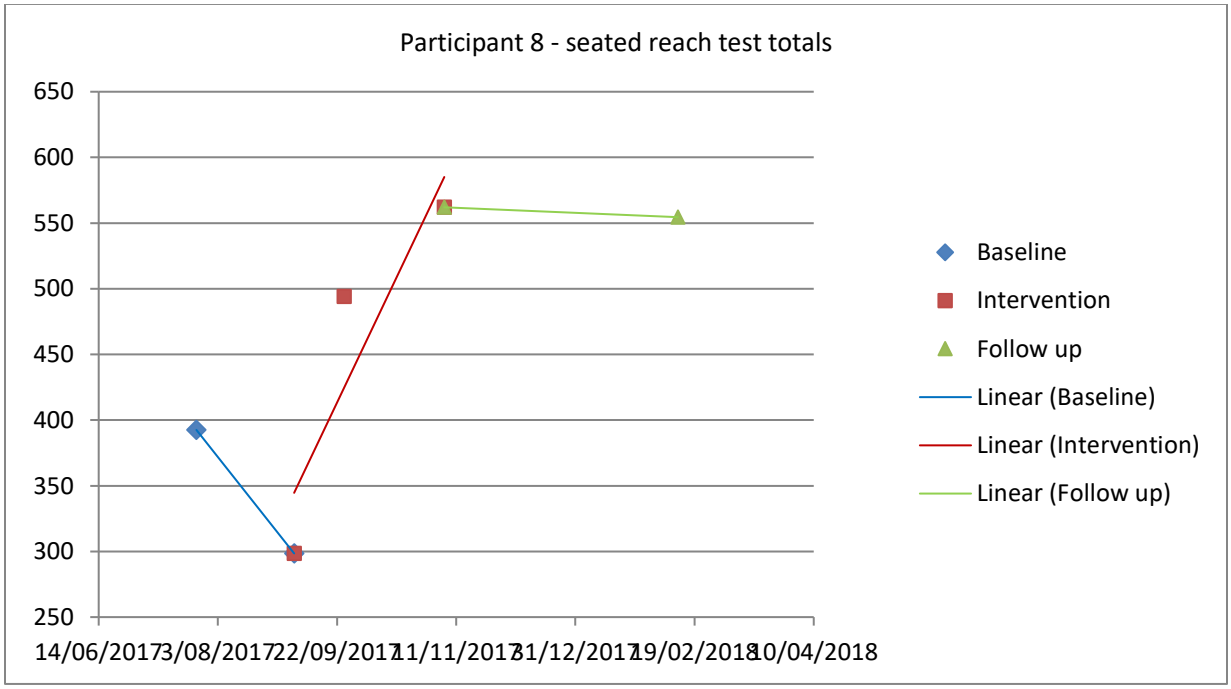


Figure 33. Graph illustrating Participants 8's seated reach totals

Ease of movement and function.

Throughout the programme she noticed improved ease of movement during class. For example, she found the post ATM reference movements easier in Weeks 2 (“much easier”), 3 (“big difference”), 4, 6 (“it’s easier than it was when I started…It was a struggle at the beginning but then everything’s kind of more relaxed”), 8 (“it felt easier”), Week 11 and Week 12. She noticed that some of the changes were sustained between classes “some things are a little bit easier” (Week 8) and at three-month follow-up.

She found that her ease of movement and function had “definitely” got easier throughout the course, “steadily all of those things because slightly easier through doing the practice each week” (three-month follow-up interview). This is reflected in her perceived exertion in movement tests. Figure 34 illustrates a decrease in total perceived effort in movement throughout the programme. However the rate of decrease is greater at baseline than during the programme so it is unclear whether the improvements were due to practising the movements during the tests or the programme. However her perceived exertion in function test results (see Figure 35) show an increase in exertion at baseline and a marked decrease during the programme.

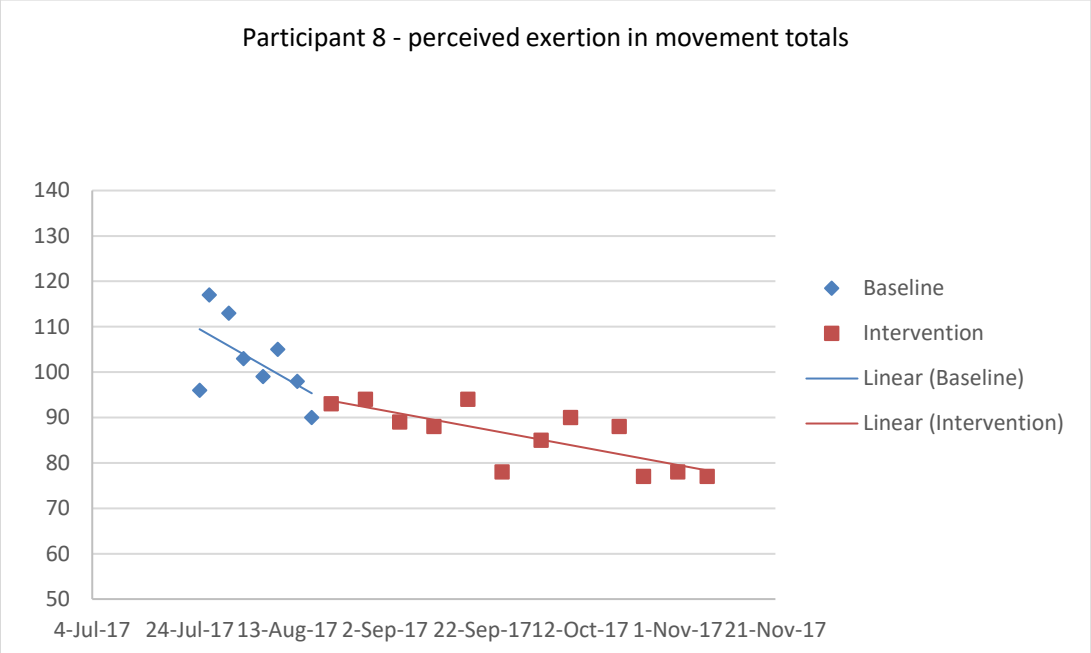


Figure 34. Graph illustrating Participant 8's perceived exertion in movement totals

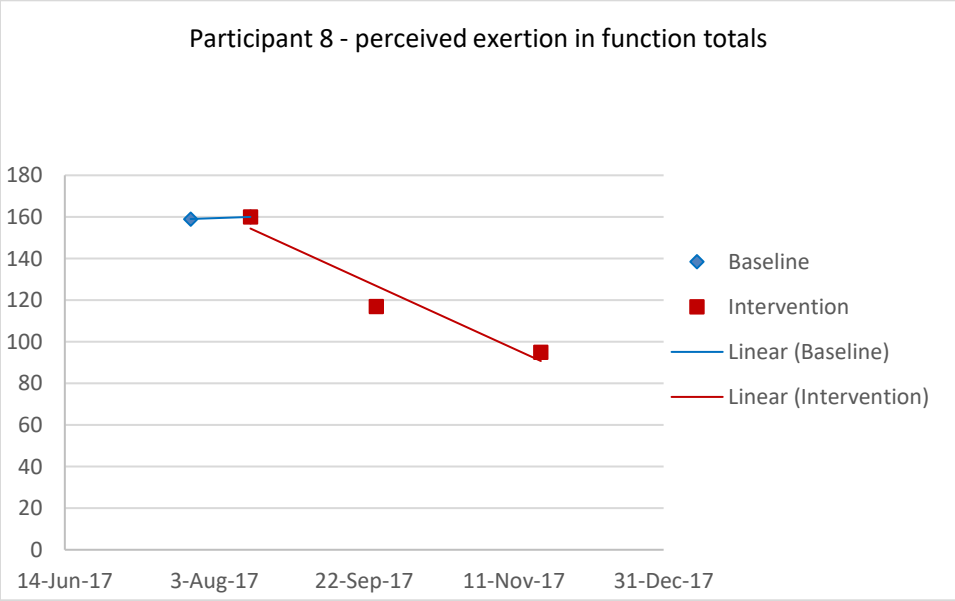


Figure 35. Graph illustrating Participants 8's perceived exertion in function totals

Body awareness and movement strategies.

Throughout the programme she observed differences in how she was sensing and moving. For example she made observations in Week 3 ("that was quite interesting feeling that connection between the shoulder and the ribs and pelvis"). In Week 8 she observed that "I'm more conscious of my body and how I'm doing it and it may be slightly easier, especially the bending forward one because I'm thinking more about where the movements coming from and things like that" and in Week 12 she had described how using her pelvis had made movement easier.

> Like you showed me then I was focusing more on just using my pelvis rather than straining through my neck and shoulders, so you know the things that you might normally be doing, it just takes a bit of unlearning…I'm learning to let that go (Week 12).

She could also feel her ribs opening more as she reached during the reach tests. "I already find that my thinking has slightly changed when I'm doing things so I'm looking for the I'm thinking about my rib cage and using their further different range of movement that makes the movement easier" (Week 12).

She found the breathing lesson in Week 4 "really helpful" and "really enjoyed" the breathing homework. This led to observations about her breathing habits. "I'm still forgetting to breathe…today driving around in the car I kept noticing I stopped breathing" (Week 6).

At the three month follow-up she found that she was still using the skills she had learnt on the programme. Her thinking about movement had changed and she was paying more attention to how she moved and what happened in her rib cage, pelvis and torso "with certain tasks, like lifting and bending, I think more about how I'm performing a movement". She had "learned

about moving from my pelvis more and my torso, I learned a lot more about the function of using the function of the rib cage and the torso".

One of the biggest changes for her was the ability to roll over in bed "I think the major has been, at night, the turning in bed". This had been difficult for her before the programme began. She referred to the difficulty she was having practising this in Week 4. "I did try to practise it though…Like in bed doing turning but I was highly unsuccessful". However by the end of the programme this was easier.

> One thing that I know that I do all the time was the exercise that you taught us about rolling, and I use that every night in bed. And that's been really helpful in helping me turn over more easily in bed…That's probably the biggie…I just do it like you show us in the class, instead of all these awkward, sort of, difficult movements that I was trying to, or had previously been trying to, do to get myself turned over in bed. So yeah that's been really helpful (follow-up interview).

She felt that the improvements in movement that she had experienced were due to learning, that the lessons had programmed her to move more naturally.

> The things that you taught us in the class I think seem to be somehow imprinted in my brain, and so when I go to do that movement, either my brain or my body or my body physiology somehow taps into that learning, into that experience, and my body remembers it, and then I'm able to bring it into my conscious thinking and do it that way. So even though I haven't been practising, the fact that that's happened tells me that if I were to start to practise on a regular basis, that I could potentially have some really

positive impact on all kinds of different aspects, including that ease of movement (follow-up interview).

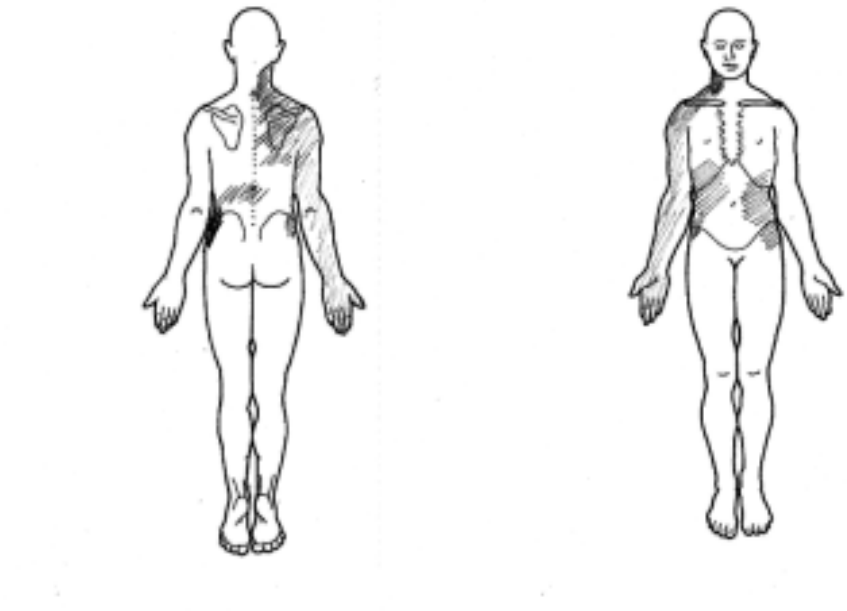


Figure 36. Participant 8 - Pre-intervention body diagrams

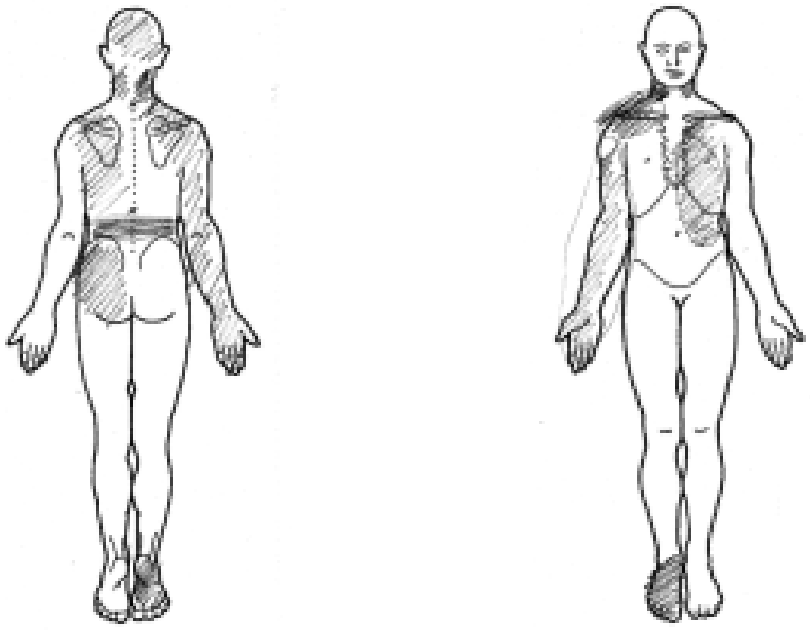


Figure 37. Participant 8 – 3-month follow-up body diagrams

It also appeared from her body awareness test that she became more aware of how she used herself when reaching. In the preliminary interview she stated that the torso, the middle of the back, shoulder, arm, hand and neck were involved in the movement. In the follow-up interview she was more descriptive of the process and had become aware of the use of her pelvis and her feet:

> I was leading with my eyes and my head I think, and then my torso, my chest, and then my arm, and my hand. I think. But I was also grounding my feet, my feet were kind of grounded and I was lifting my, and leaning on my right hip, and lifting this, buttock up, and using this bit…

Comparing Figure 36 and Figure 37 illustrates that she gained more awareness in her right foot, left buttock and left ribs.

Symptom control.

For Participant 8, pain was an ongoing problem. She often felt pain immediately after the lesson but that pain fell away and movement felt easier "at the end of each class I always felt better" (follow-up interview). The most significant example of pain reduction was after the lesson in Week 6 when she noticed a dramatic improvement which she later described as "like magic". In an email to me the next day she wrote:

> I just wanted to let you know that I have experienced a significant change - improvement - in pain since our lesson yesterday…Throughout the class, I was finding it pretty difficult and painful and was a bit sceptical as it seemed to be just making my pain worse, but this morning when I woke up, the pain I've been experiencing in my very low back/pelvic region, was gone! Yes! Gone! On getting up and moving around, it came

back, but not nearly as bad as it has been for a few years now. I have found today that sitting, walking, and standing has been less painful and felt more stable and easier.

However the following week she missed class because she had had a flare-up from doing too much gardening over the weekend. In Week 8 she was still experiencing the pain from the flare-up but was looking forward to the lesson and hoping it would help. It appeared from her comments in Week 8 that the lesson had made her feel a little better. By follow-up she felt that, if she continued to use what she had learnt on the programme, this could influence her pain "I just need to make the effort and be consistent" (follow-up interview).

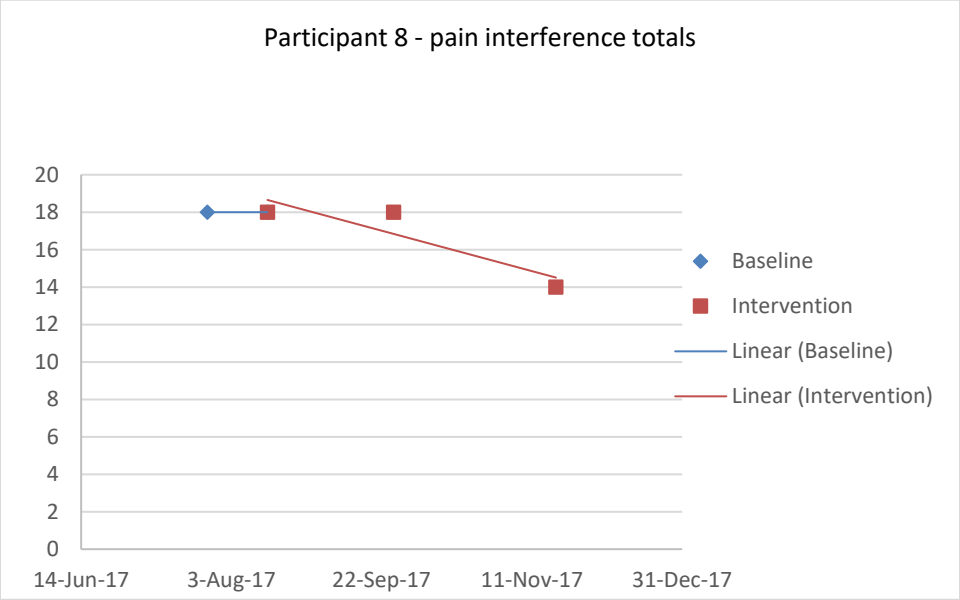


Figure 38. Graph illustrating Participant 8's pain interference totals

There were a number of outside events during the programme that aggravated her pain. These included a sprained ankle in Week 1 (exacerbated in Week 3 as a result of splinting), a flare-up due to gardening in Week 7 when she could "hardly move" and recovery from surgery in Week 10. So when I asked her in the follow-up interview whether there'd been any reduction in pain interference during the programme she found this difficult to answer as there were so many

other things going on with her body. Figure 38 and Figure 39 suggest that her worst pain and pain interference were stable at baseline but had dropped by the end of the intervention.

She also felt more relaxed after the classes and felt that it could be beneficial in a similar way to meditation or yoga: “it really kind of centres and ground you, and it relaxes you, so that could be quite helpful for stress management and those sorts of things, and anxiety, and your mood as well” (follow-up interview).

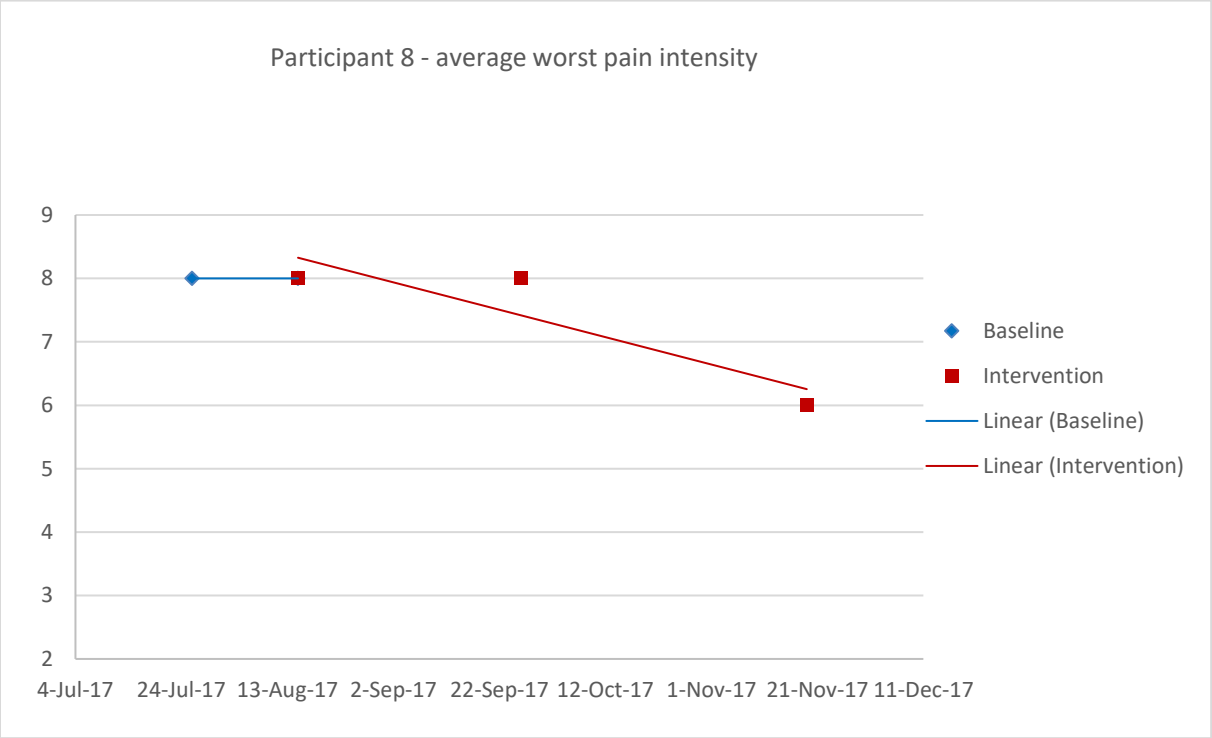


Figure 39. Graph showing Participant 8's average worst pain intensity

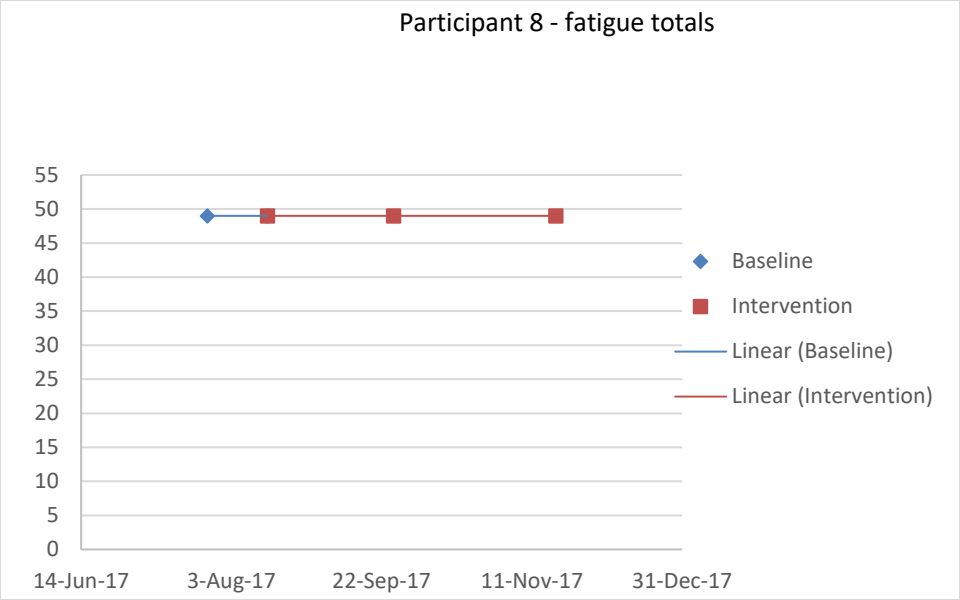


Figure 40. Graph illustrating Participant 8's fatigue totals

The results of her fatigue tests (see Figure 40) suggest that fatigue was high and constant throughout baseline and the programme.

She felt that the programme given her confidence in her ability to manage her symptoms. Having a complex health problem she had come to accept that there wasn't a lot she could do to improve her condition. However as the programme progressed she came to realise that she had some control.

> If you have kind of complex health issues, and you've been searching for answers to improve certain aspects over time, there are things that you just, sort of, come to accept as well that's just the way it is and actually there isn't a lot that I can do to improve that. But, during the course, like doing the classes, then there are other aspects that you come to realise that actually you can have a reasonable amount of, or a significant amount as the case may be, on certain aspects.

She felt however that it would have had more impact if she had not had so much going on such as her surgery. Her increase in confidence is supported by her IPQ results (Figure 41) which

suggest that although she had a drop in her confidence in her ability to control her symptoms at baseline, her confidence gradually increased throughout the programme and exceeded her baseline measures by the end of the programme.

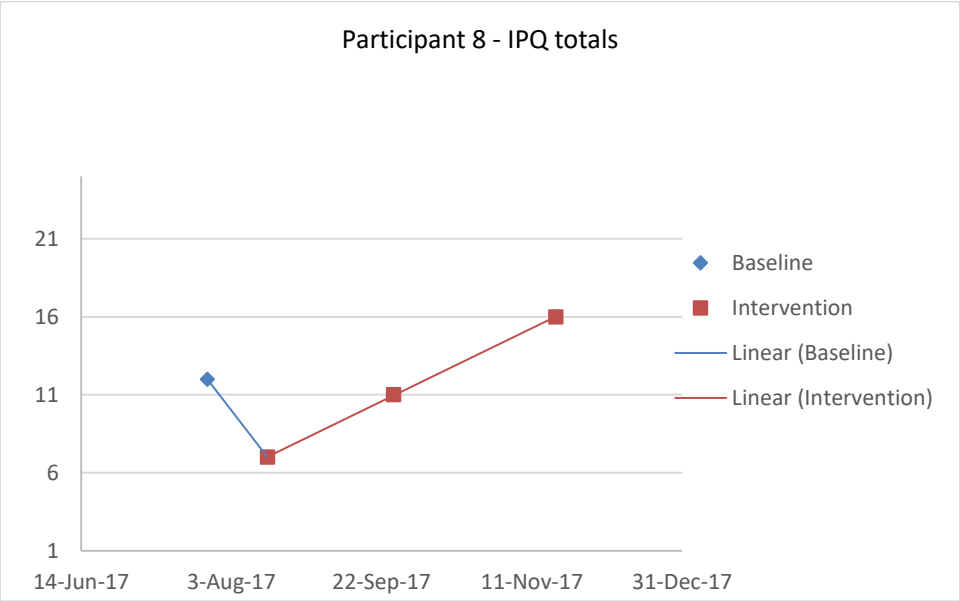


Figure 41. Graph illustrating Participant 8's IPQ results

Knowledge and skills.

She felt that the course taught her a lot about movement and that there were different options available to her.

> I learned a lot about my body and how it works and how it moves, and it made me think more about the way that I move my body just in, sort of, daily life and how I go about putting my shoes on or reaching for things, or whatever. So that was, I think, incredibly informative…Just the idea that there is a different way of doing things that could be better and more helpful and easier. For me was kind of a lightbulb moment (follow-up interview).

Attitude to programme.

Personal value.

For Participant 8 the programme was "a magical, mysterious, sort of revelatory experience… it was kind of how can something, these tiny little things, have such a big impact" (follow-up interview). "It's like just a complete mind shift to how I would normally do things. It's opened up my mind to a completely different way of doing things" (Week 12).

She found the whole programme "really, really, educational and informative," "I just thought that it overall was very beneficial, very informative, like, I learned a heck of a lot from it, and it made me aware and conscious of these, of this different way of doing things, it kind of opened up a new world" (follow-up interview).

She was "tremendously appreciative and grateful" for the opportunity to participate in the programme. "It was a really great experience to have an opportunity like that. That was literally, I think, a once in a lifetime opportunity" (follow-up interview).

She also appreciated my patience with the group "through all those weeks, even though sort of various things happened, like falling down the stairs and operations and what not, that you were so patient with all of us, through all our happenings and forgetfulness and whatnot" (follow-up interview).

She found that my story was an inspiration to her. "To hear your story about how you've been doing it for such a long time and what you were like before you started, and what you're like now, was really inspirational" (follow-up interview).

The fact that she had always felt better at the end of each class reinforced for her the need to keep practising. She hoped to continue practising the **Feldenkrais Method** in the future,

setting aside a little time every day where she would watch or listen to a recording and then practise the movement.

> Because I always felt, at the end of each class I always felt better. And then after that class, during that week until the next class, I was in that frame of mind where I was thinking more consciously about it. And actually trying to put it into practice. So I think that kind of, for me, reinforces the notion of how important it is to keep practising (follow-up interview).

She found the homework reinforced her learning. “I found it really helpful to, kind of, clarify in my own mind what you’d been teaching us in class. And to reinforce that learning” and she appreciated the fact that the homework remained available to them when the programme was over.

Relevance to others.

She implied that the programme could be useful to others. For example, in response to Participant 7’s question in Week 12 regarding why it wasn’t part of the Burwood’s rehabilitation, she stated “that’s a really good question” and in her follow-up interview she stated

> That was literally, I think, a once in a lifetime opportunity, to be able to participate in a study like that, that may not only benefit other people in the future from the results of your research, but also for us individually (follow-up interview).

Future considerations.

She felt that I could have done more each week to reinforce what they had learned in previous classes even though it would make the class longer.

> I remember one activity was around teaching us an easier way, a less physically demanding way of bending, which could be applied to, for example, putting on your

shoes during the day, so I think maybe if each week during the classes if we added in a few more of those, or had repeated that activity again each time. It would've added a little bit to the length of the class perhaps (follow-up interview).

Participant 9.

Participation.

Figure 42 shows which classes Participant 9 attended and his reasons for absence.

1	2	3	4	5	6	7	8	9	10	11	12
		Meeting with builder		In a meeting			In a meeting	Class cancelled			Overseas

Key:
Present

Figure 42. Participant 9 - dates of attendance and reasons for absence

As shown in Figure 43, during the programme he accessed the online homework in Weeks 1 and 4. He also practised some of what he did in class, watched the DVDs and did some of the movements from the DVDs when he was at home. He said that, although he found the online homework he did "really useful", there was a lot going on in his life and generally he forgot "it was sort of like, you know, something comes in and I think like, 'Oh yes I'm just going to do it a bit later', and then I forgot", "but it's only that time factor, and because I was about to travel it was so much in my head" (follow-up interview).

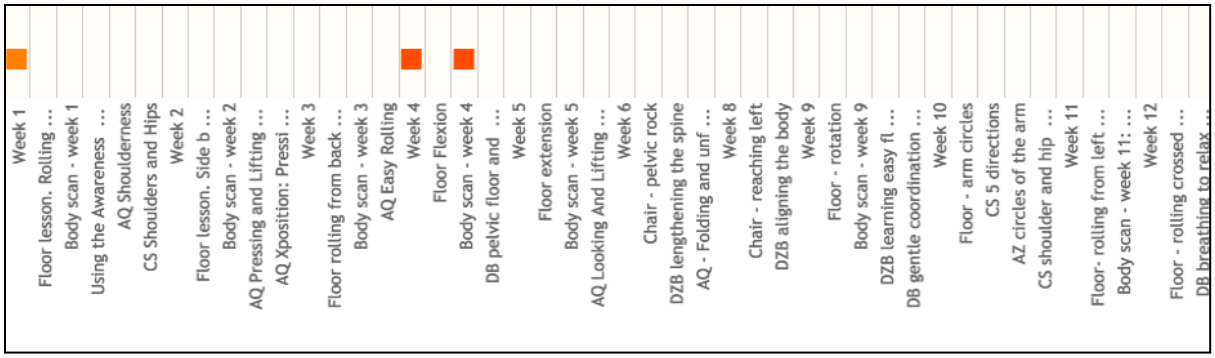


Figure 43. Participant 9- online homework files accessed during the programme - 21 August to 6 November

Programme impact.

Posture and balance.

He observed improvements in his posture and balance after the ATMs, for example, in Week 4 he felt that he had better posture in the car after the sessions, in Week 6 he felt straighter, in Week 7 he felt better in his wheelchair after the lesson, and in Week 10 he could reach further. He also stated in his follow-up interview that he had found the programme useful for reaching, balance and improving his sleeping position.

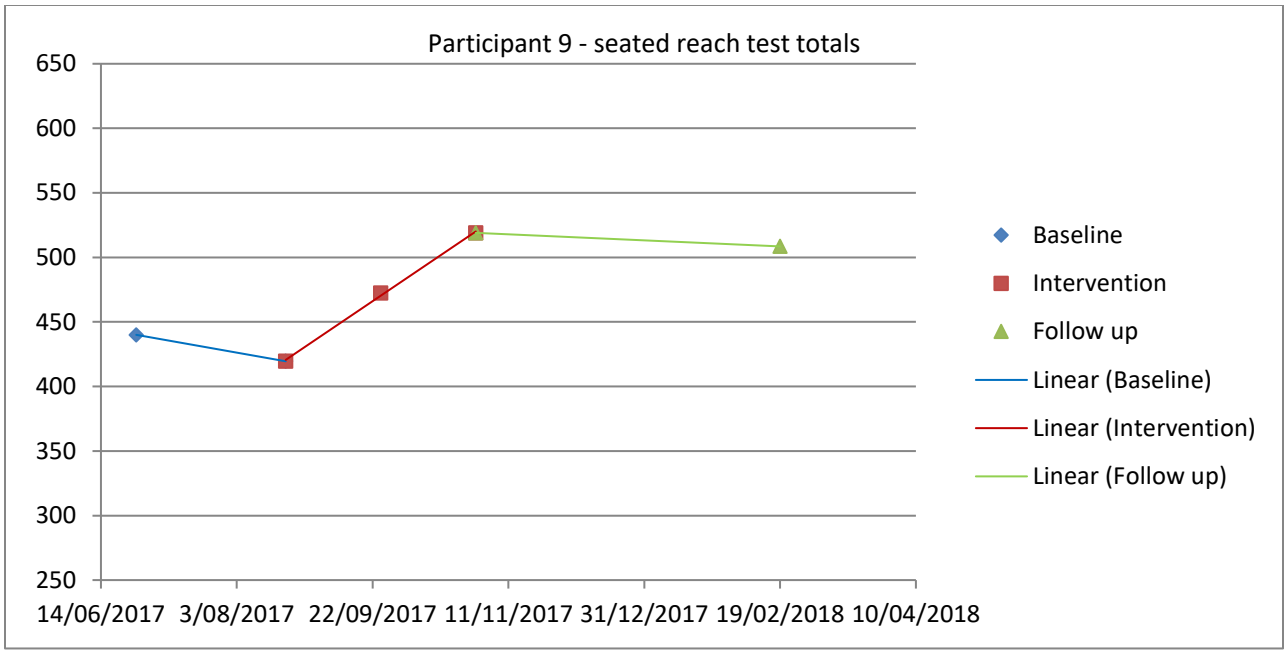


Figure 44. Graph illustrating Participant 9's seated reach test totals

His seated reach totals indicated a slight decrease in performance at baseline and a steady increase throughout the programme (see Figure 44). Improved performance was maintained at 3½ month follow-up despite the fact that he injured his knee between the end of the programme and follow-up. These results suggest that the programme contributed to improved movement and function.

Ease of movement and function.

For the Week 1 pre-ATM reference movement I asked them to pay attention to what they felt was inhibiting their range of movement. In this lesson he couldn't feel anything inhibiting his movement so there was no reference point against which he could potentially feel changes at the end. However in future lessons his awareness increased and he was able to feel positive changes. For example, he found it easier to perform the post-ATM reference movements in Weeks 2, 4, 6 ("much better"), 10 and 11.

Participant 9's perceived exertion in movement results (see Figure 45) indicated that movement became easier as the programme progressed. However the rate of improvement during the programme is very close to the rate of improvement during baseline so it is not clear whether or not the programme made movement easier or whether improvements were merely as a result of practice when doing the tests. However his perceived exertion in function increased at baseline and decreased during the programme to below baseline levels. He confirmed in the follow-up interview that movement did in fact get easier.

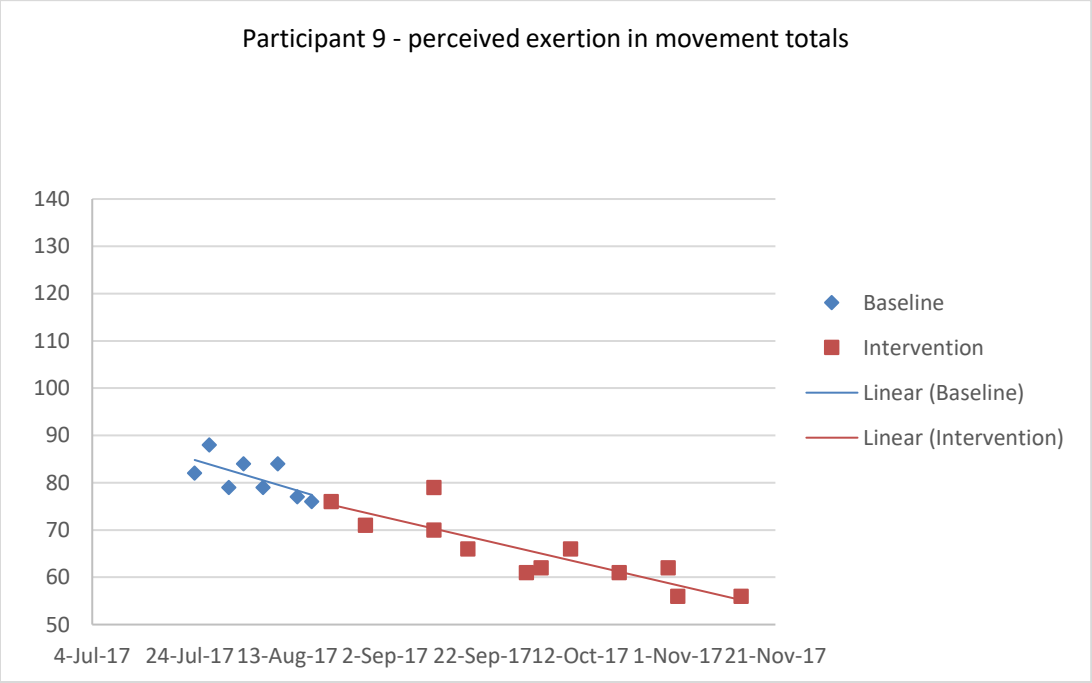


Figure 45. Graph illustrating Participant 9's perceived exertion in movement totals

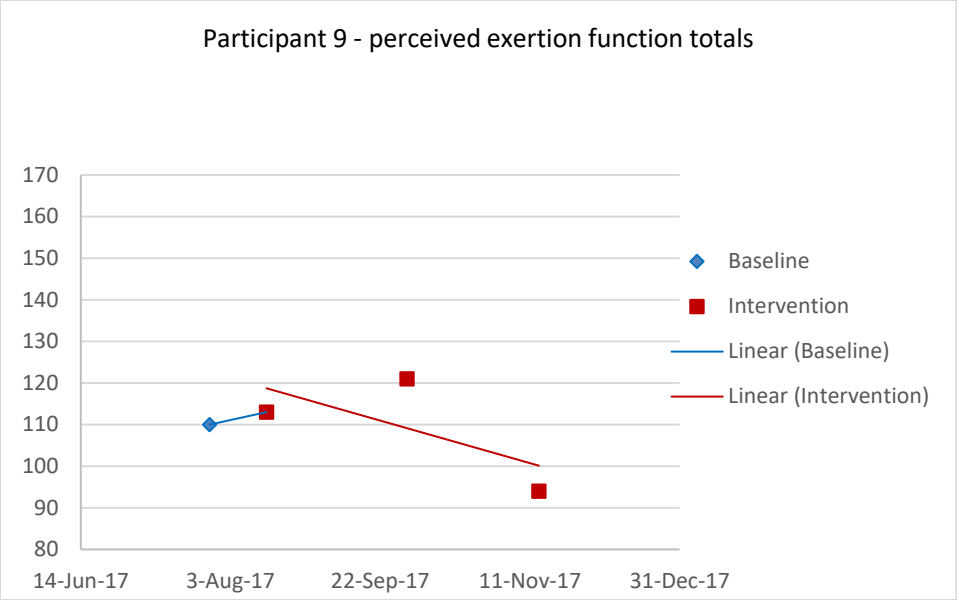


Figure 46. Graph illustrating Participant 9's perceived exertion in function totals

Body awareness and movement strategies.

He noticed some changes in his movement strategies. For example, he found the breathing lesson valuable and that moving became easier when he paid attention to his breath "when you're really trying to get something right and you can't do it but you incorporate the breathing and you can do it right" (beginning of Week 10). At the end of the lesson in Week 10, when he found it easier to do the reference movement, he commented "I feel like I'm breathing properly".

A significant change for him was his ability to get into his wheelchair from the floor. I noticed when viewing the videos that, over time, he became more independent in getting into his wheelchair. In Week 1 an assistant lifted him into the wheelchair from under his armpits while he pushed with one arm into a standard chair to assist with the lift. In Weeks 2 and 4, he pushed into a standard chair to raise himself up and had minimal assistance from the assistant. (The assistant gently guided his pelvis into the wheelchair.) In Week 7 he got into the wheelchair on his own by pushing into a standard chair to raise himself up. In Week 10 he got into the wheelchair without

the use of the standard chair but he leaned on the standard chair briefly for support once he was in the wheelchair. In Week 11 he got into the wheelchair without an assistant. It wasn't quite clear from the videos whether or not he briefly used the standard chair. In his follow-up interview (3½ months post intervention) he told me that during the programme was the first time that he had been able to get into his wheelchair from the floor "being on the floor and getting up from the floor to my wheelchair, that hasn't happened before…until I ended up doing it here", "that's how it really given me some impact in my life, you know, in my movement, because that's where I started getting from the floor to my wheelchair" "I'm really happy when I get on the floor, on the carpet I can go in my wheelchair easily" (follow-up interview). He attributed the improvement to the spiralling strategy I had taught them during the programme which had given him "a strategy, strength" for getting into his wheelchair.

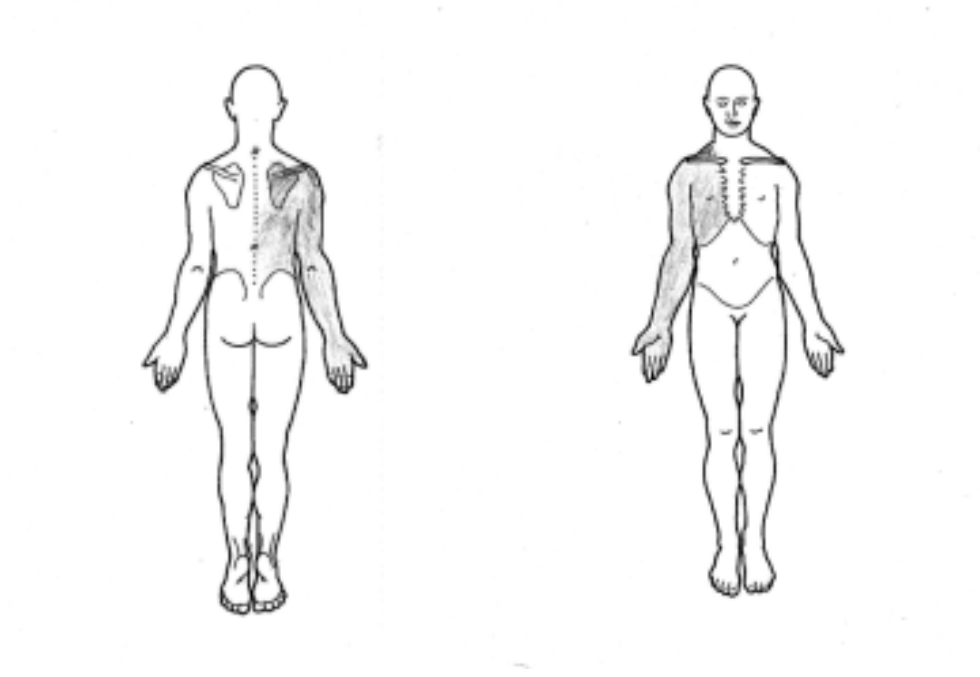


Figure 47. Participant 9 - Pre-intervention body diagrams

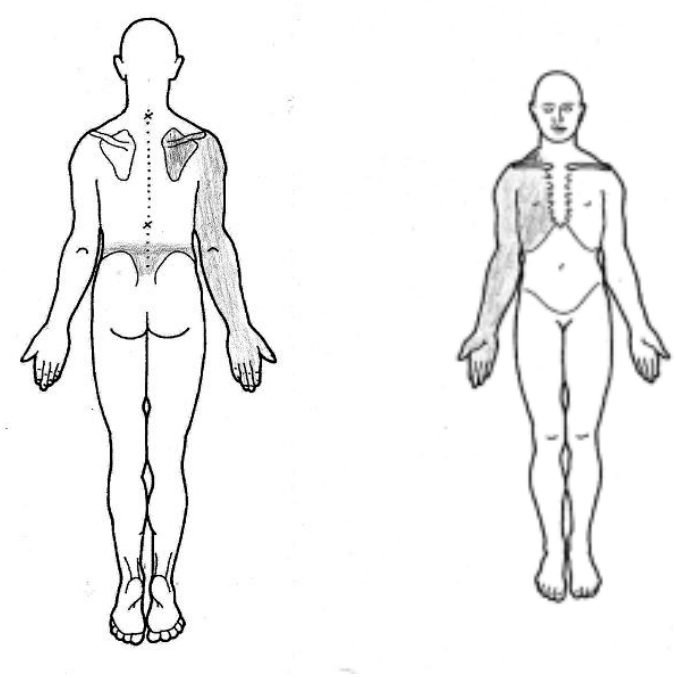


Figure 48. Participant 9 – 3½-month follow-up body diagrams

I first interviewed him in 2016 as he was an applicant for the programme that I ended up cancelling. At the time, he found the body awareness test "really amazing". It seemed to be the first time he had paid attention to what was involved in his movement. However, it is not clear from the body awareness test whether or not his awareness changed. In the 2017 preliminary interview he remarked that he could feel the head, fingers and muscles under his arm as he reached. While he coloured in the picture he also added the neck, shoulder, hand and trunk. In his 3½-month follow-up interview he remarked "OK, so you've got your hand, shoulder, and I think, spine I think." The only change apparent when comparing Figure 47 and Figure 48 is an increased awareness of his lower back which is not surprising given that he seemed to learn to lengthen his lower back more during the programme as described on page 233.

Symptom control.

Although in Week 1 he found that the movements in the ATM increased his spasm, throughout the rest of the programme, he found that some of the ATMs helped to relieve his

spasm. For example, after the Week 2 ATM he found that he had less spasm and felt softer and he found the extension lesson in Week 5 really helpful.

> Another thing I think we did that really helped me you know how we lie down and then we use our nose to touch the elbow. That one really helped me because from there I never had a spasm like from here home and then before I go to bed it was fine. I thought it was really good (Week 10).

In the flexion lesson in Week 4, I noticed that he had a tendency to contract the muscles in his back or extend when trying to lift the head when supine or reaching forward. I pointed this pattern out to him and worked with him individually to see if he could allow the muscles to lengthen. He was able to change this somewhat but it was a challenge. At the end of the lesson he said that normally when he bends down the spasm in his back is a problem but as a result of the lesson this had improved. “I used to have tightness like spasm in my back so going down becomes a bit you need like a support to get up but now by doing that it is sort of like a bit easy”.

By Week 7 he was using strategies to release his spasm that he had learned in class at home. For example, he found that a movement that we did in the Week 6 lesson (moving his legs apart and together) as he rolled his pelvis relieved the spasm in his back “all the tightness in my lower back has been released” and used this movement to relieve his spasm at home “it really helps me because I get some strong spasm…I’ll be in my chair and my lounge and I’ll tip backwards and it gets wee releases” (Week 7). However, as he pointed out in his follow-up interview, although the programme helped with his spasm, it always eventually returned: “during the training the spasm goes, but comes back” (follow-up interview).

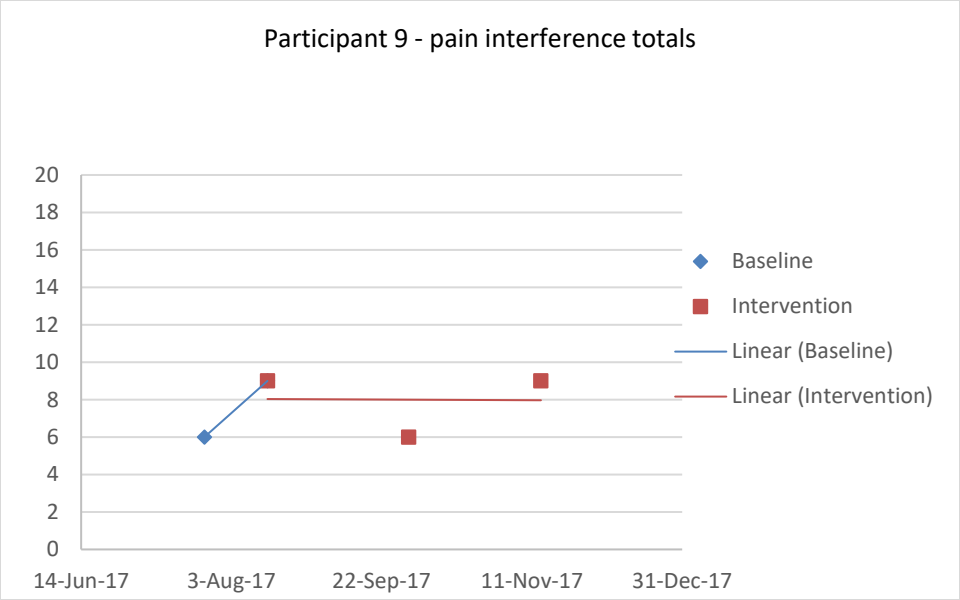


Figure 49. Graph illustrating Participant 9's pain interference totals

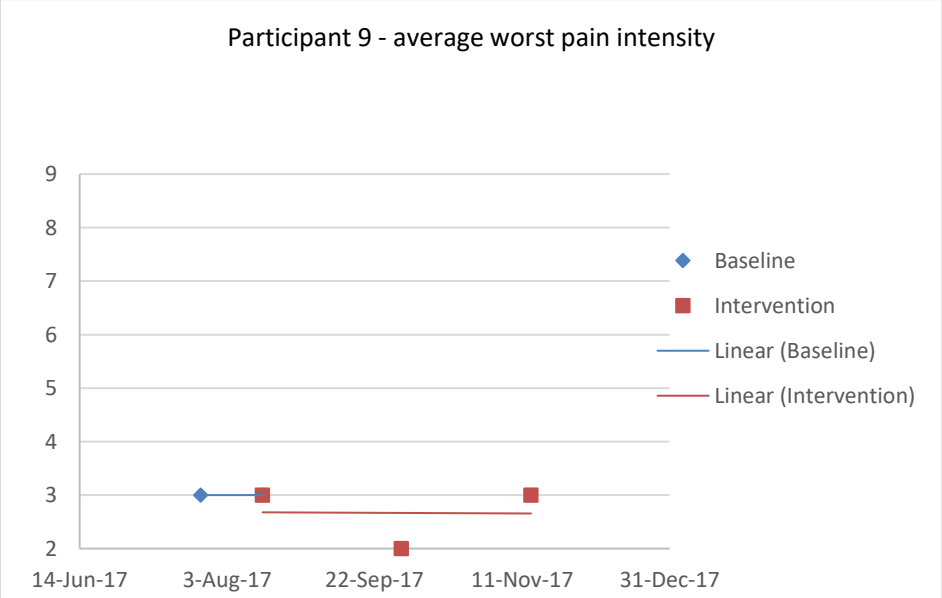


Figure 50. Graph illustrating Participant 9's average worst pain intensity

He found that sometimes the classes relieved the pain and sometimes they didn't. But the pain tended to come back later "with my pain, it's on and off…so sometimes it relieved it and sometimes…it doesn't, but it's more or less like, it goes and it comes back" (follow-up interview). However he was using the strategies he had learned in class and found they relieved "a lot of pain".

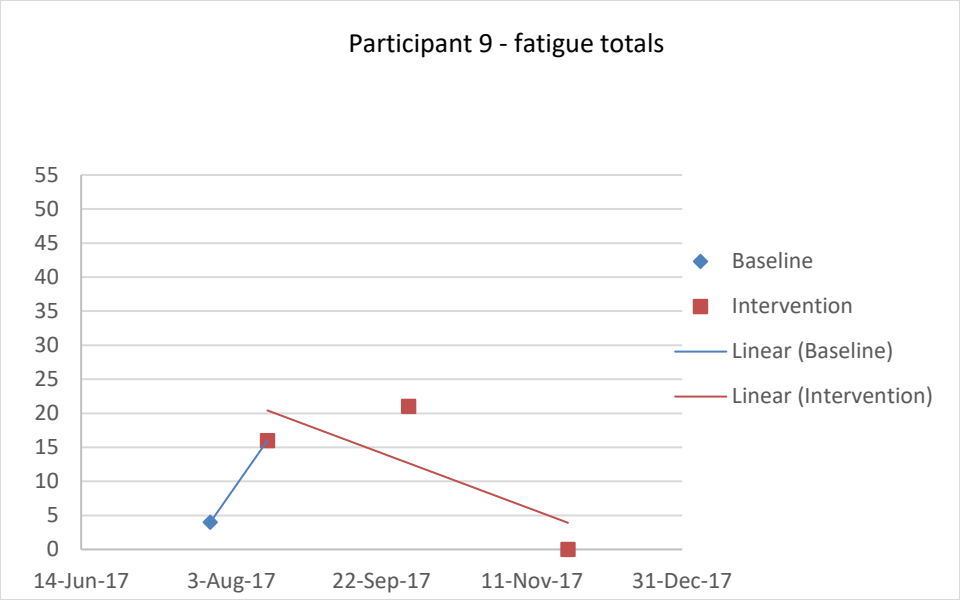


Figure 51. Graph illustrating Participant 9's fatigue totals

His pain and fatigue levels were variable throughout the programme (see Figure 49, Figure 50 and Figure 51); there was no quantitative evidence that the programme had had a sustained effect on his symptoms.

He felt that the programme didn't influence his belief that he could control his symptoms as he said he was already very positive in that regard. However he felt that continuing to use what he had learnt in the programme could influence pain, spasticity, fatigue and ease of movement.

His IPQ results (see Figure 52) were variable showing a very strong increase at baseline and then a drop off at the end of the intervention. However some of this variability may have been due to how he completed the tests as he found it "tricky" to answer the questions; it was hard to decide what rating to give to each of the items (follow-up interview).

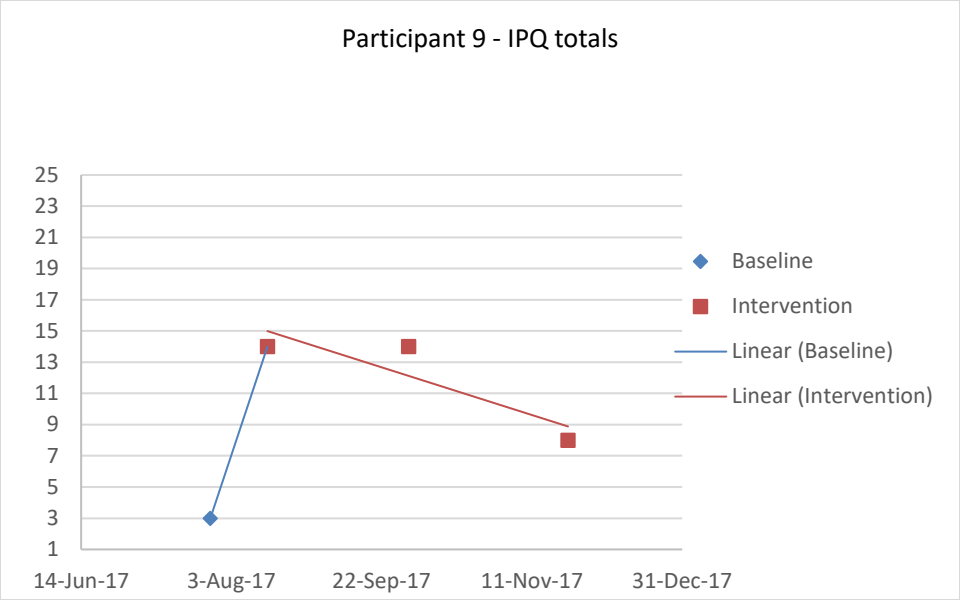


Figure 52. Graph illustrating Participant 9's IPQ totals

Knowledge and skills.

He felt that he had got "a lot of useful stuff from" the programme. "It's really improved a lot of things in me" and it had given him "a lot of things to think about it and it did helps me". He found that he could take some of what he had learnt in class, apply it at home and gradually improve (follow-up interview).

Attitude to programme.

Personal value.

He found the programme "really good" and thought that in the future he might continue to use the method by reviewing the lessons he was taught in the programme and getting further advice from me. He also thought he would be interested in attending the programme again. "If you run it again I think that would be really good" (follow-up interview).

He felt that all the lessons he attended were beneficial and were relevant to a variety of functions. For example "You know, positioning yourself on the bed, turning, just being lying and turning your eye, your face and stretching your hands to pick up something, sleeping on your

tummy can release much of your pain, spasm, and then also getting up from bed can also helps you…and that why most of the things I've been using at home as well" (follow-up interview).

Participant 10.

Participation.

As shown in Figure 53, Participant 10 attended eight classes. He appreciated that "the more times you come the more you get out of it" (Week 7) and so in Week 10 when he had a cold, he rang me that day to ask if I thought he should still come. We agreed it was not a good idea as others could catch it. He suggested that if everyone cancelled I should let him know and he would come.

1	2	3	4	5	6	7	8	9	10	11	12
	Out of town		On holiday					Class cancelled	Had a cold		

Key:
Present

Figure 53. Participant 10 - dates of attendance and reasons for absence

As shown in Figure 54, Participant 10 accessed online homework during the programme for every week except Week 6 and Week 11 and accessed the rotation lesson in Week 9 five times. Although he initially had difficulty with the body scans, he persisted "I did practise lying on my back in bed but trying to do what we did at the start of the first week" (Week 3). By Week 5 he was doing his own body scans about three times a week when he went to bed "I try… I'm not very good at it… at night to go through what you do". The main barrier to doing the homework was time. Given this he preferred doing the body scans to the ATMs because they weren't as long: "15 to 20 minutes is a good time" (Week 6).

Although it appears from Figure 55 that he accessed a couple of the lessons after programme completion, at five week follow-up he hadn't practised any of the lessons due to time constraints.

> I haven't done any of the exercises or anything like that, so, which is a factor of time and setting that aside…the smaller timeframe ones work better with me, just trying to squidge them in in the day or something like that (follow-up interview).

He initially needed to borrow a DVD player to do the DVDs (Week 6) but by follow-up he had played a few of the DVDs, just to check that they worked, but hadn't actually been through them all.

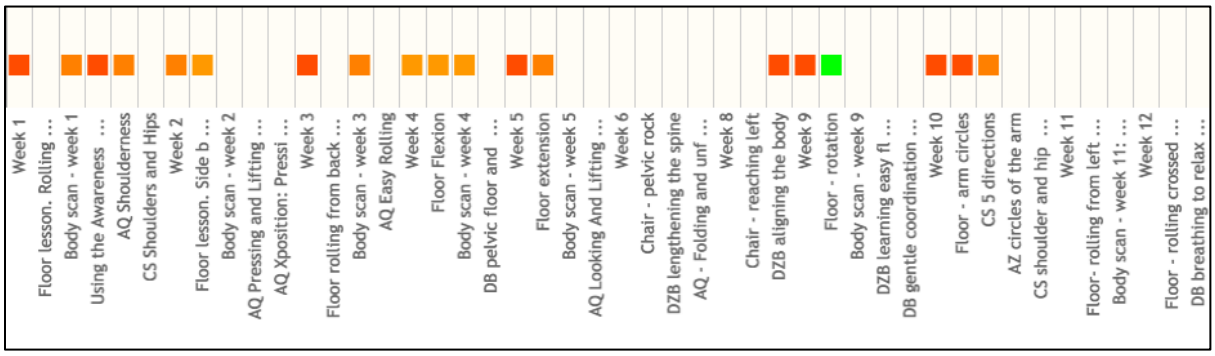


Figure 54. Participant 10- online homework files accessed during the programme - 21 August to 6 November

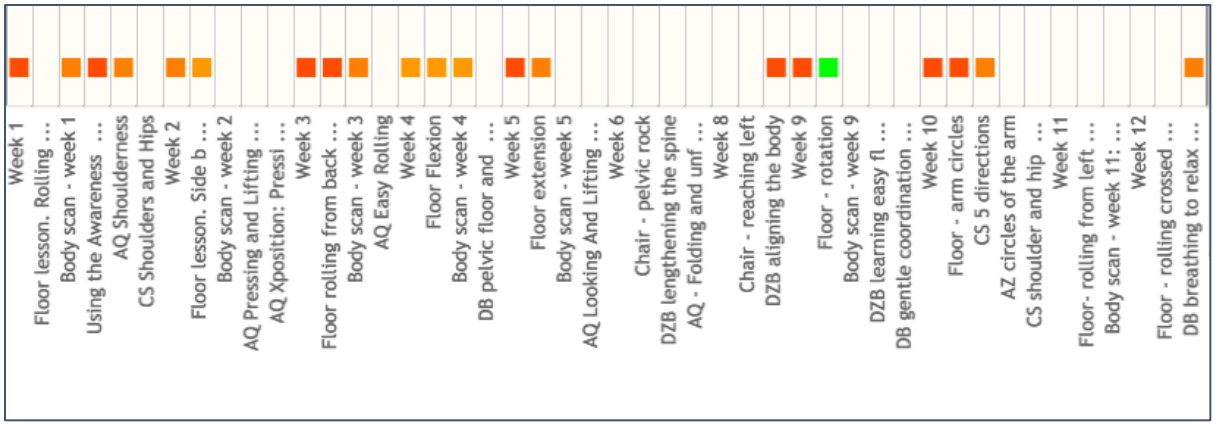


Figure 55. Participant 10 - homework files accessed 21 August 2017 to 1 February 2018

Programme impact.

Posture and balance.

He valued the effect that the programme was having on his balance (Week 7) and he noticed improvements in sitting posture and balance after some ATMs, for example in Weeks 6 ("I'm sitting up more"), and 8 ("the first time I felt like I was like this, left shoulder forward but now I actually feel squarer", "I feel like I'm over them [sitting bones] more"). He could reach further in Weeks 2 and 8 and when doing the post-ATM reference movement (reaching left), he was not falling over as much.

At times he found his standing balance had improved after the lessons, for example Weeks 5, 6 ("I'm probably a bit straighter, taller"), 7 ("whenever I do these things you actually feel like you are a bit better balanced as opposed to thrusting your hips forward"). He also noticed a change in his walking after the Week 8 ATM ("it feels different but I can't put my finger on why…more fluid"). He said that the floor felt different, but he wasn't sure of the right word. I suggested "more connected?" He agreed "Yeah that might be a good word".

Some of this improved posture was sustained at five week follow-up.

You don't actually tend to know why you just sort of like, standing and something like that and you go, 'I think I'm standing a bit straighter', or you know whatever, and you go, 'Oh!' And so it's a realisation (follow-up interview).

His seated reach totals (see Figure 56) illustrated an improvement during the programme with his five-week follow-up results exceeding his baseline results. This suggests maintained improvement in balance.

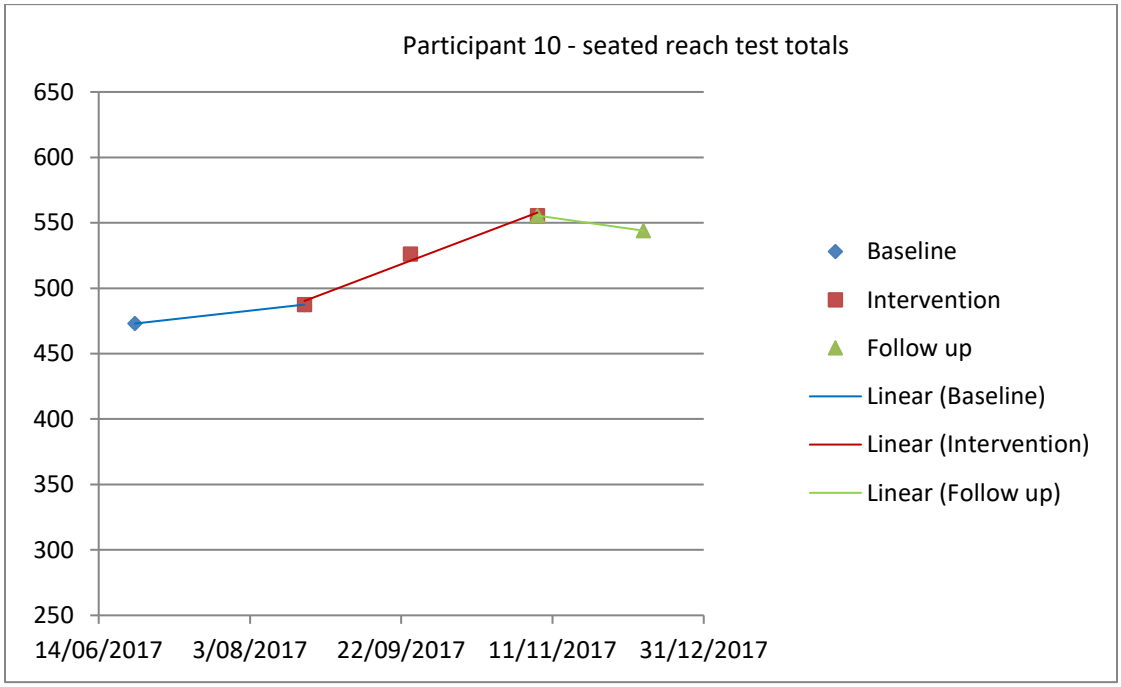


Figure 56. Graph illustrating Participant 10's seated reach totals

Ease of movement and function.

He noticed improvements in his movement after some of the ATMs. For example, he found the post-ATM reference movement easier in Weeks 2, 3 ("when we started, reaching over I could barely touch the ground. In the end I could reach my whole hand over there without really straining"), 6, 8, 10, 11 and 12. By Week 12 he had noticed that some of the changes were sustained. "Some things are easier than what they used to be" (Week 12).

His perceived exertion in movement results (see Figure 57) also indicated that movement became easier as the programme progressed. However the rate of improvement during the programme was less than the rate of improvement during baseline so it is not clear whether or not the programme made movement easier or whether improvements were merely as a result of doing the tests. However his perceived exertion in function increased at baseline and decreased during the programme to below baseline levels and in his follow-up interview he stated that movement had become easier for him. Although most of the perceived exertion tests were easy for him in the beginning, he found that the lateral flexion and flexion tests which had been quite "tricky" for him had become easier.

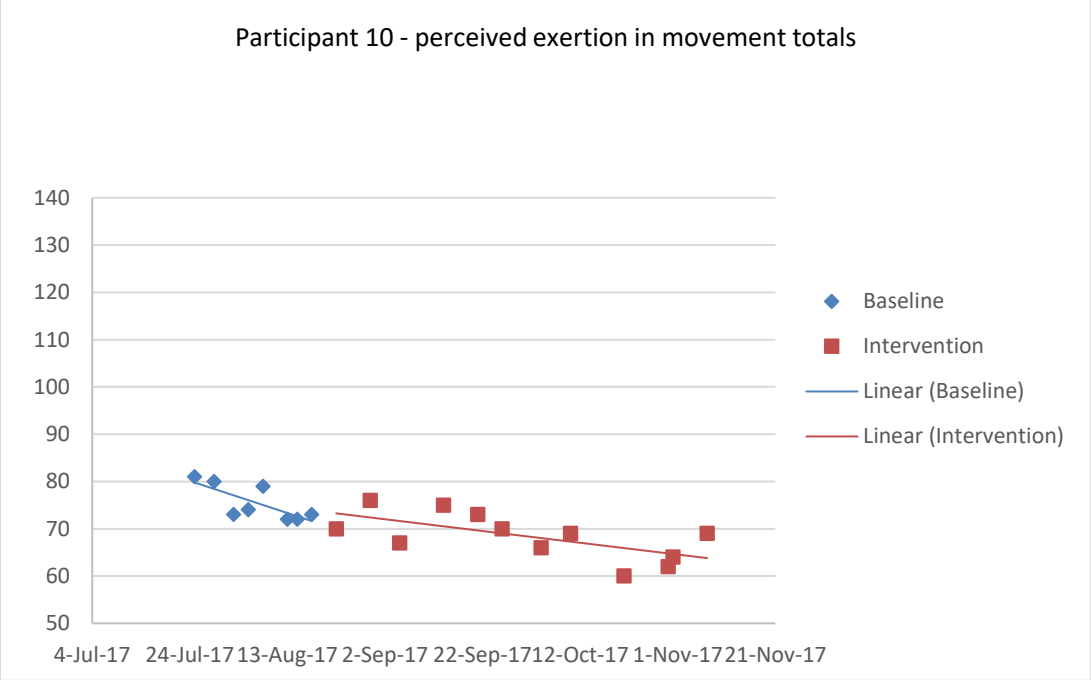


Figure 57. Graph illustrating Participant 10's exertion in movement totals

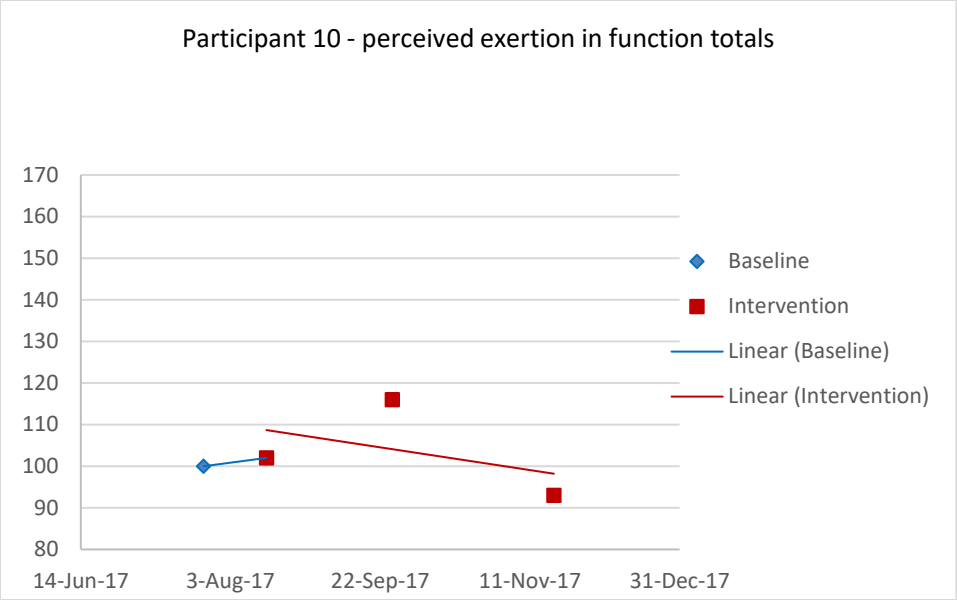


Figure 58. Graph illustrating Participant 10's perceive exertion in function totals

Body awareness and movement strategies.

To begin with he had difficulty paying attention to himself. In Week 1 he said that he had difficulty with the body scan. He found it hard to concentrate on his ribs and his attention drifted during the lesson "my to-do list kept dropping into my brain". He reiterated this before the lesson in Week 3: "That's the bit I struggle with…when you say feel ribs. I can't do that…It appeals but I'm struggling with it". However, by the end of the lesson in Week 3 he was starting to make distinctions. "At the end my right side appeared to be way more relaxed than my left side". At the end of the lesson in Week 5 he said that he was finding it easier to do body scans. "I could actually sense more because I'm getting used to being aware". From Week 5 he seemed to be more aware of how he could change the way he moved and made observations about what he had noticed. For example, in the Week 6 ATM he could feel that the initiation of the movement was now lower down, in Week 7 he commented that "you can feel the whole arching of the spine as opposed to just throwing the head back", in Week 8 he commented "I think I'm using my legs

a bit more" "I'm probably using the ribs more too" and in Week 12 he observed "for me it was very important what you do with your head".

In Week 11 he described how using more of his body assisted with his range of movement. He had been struggling with circling his arms in the arm circles lesson because of limitations in his movement and muscle pain at the top of the shoulder "basically because I use my shoulders a lot". However when Participant 7 pointed out to him that using the whole body makes the movement a lot easier, he remarked:

> last week's one where I first did it I just got me to reach for the pen or cup or whatever I could do that [reaching left with right hand, no torso rotation] but at the end of it I was actually doing that [rotating torso to the left] and my whole torso was twisting and I could do a lot more.

At the beginning of Week 12 he observed the challenges involved in opening up the ribs. Yet even so he could feel the distinction that arose out of paying attention to one side.

> Trying to open up since I use all these muscles quite a lot [shaking his arms] I could collapse them but I couldn't reopen them but in the end you felt that whatever it is down there [pointing to the back of the rib cage] whenever you went over were really sort of stretching. You definitely noticed a difference between the sides… The left side felt way bigger then the right side.

At five week follow-up he had continued to use the skills he had learnt on the programme and he found that he had sustained some changes. Sometimes he just suddenly realised that he was doing or could have done things differently. "You do something and you go, 'oh that was

different than how I've done it'" (follow-up interview). "You're doing something and you go 'ooh I should have done that differently' or it's just you know 'that was easier or I approached that differently'" (Week 12). At other times it was a conscious choice.

> Reaching for something or just even standing, or walking, or sometimes just lying in bed and you go to turn over and you go, 'Oh, I know what I'll do' and then you just turn over not the way that I turn over, the way that you try to get us to turn over…I usually just, what I do I usually just turn my shoulders and everything else follows me, as opposed to bringing, making a more consistent movement where you're actually bring the leg over at the same time and you usually tend to go like that as opposed to, you know, like a corkscrew where you do one bit and the rest just follows…it makes it a more, a full body motion as opposed to, you know, you throw yourself and the rest of it follows (follow-up interview).

The changes were "usually quite subtle and so they're not earth shattering things where, like [Participant 6] had where it was the pushing and stuff like that where that was quite a different way of approaching it totally" (follow-up interview).

I could also see that changes in his movement strategy during the range of movement tests. In the baseline tests he tended to move his head in the opposite direction to which he was reaching. By follow-up, this pattern was less pronounced and he was tending to move his

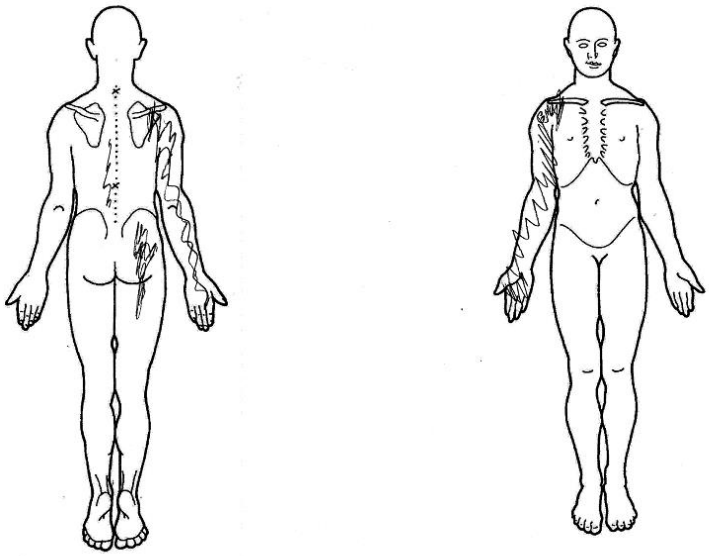


Figure 59. Participant 10 - Pre-intervention body diagrams

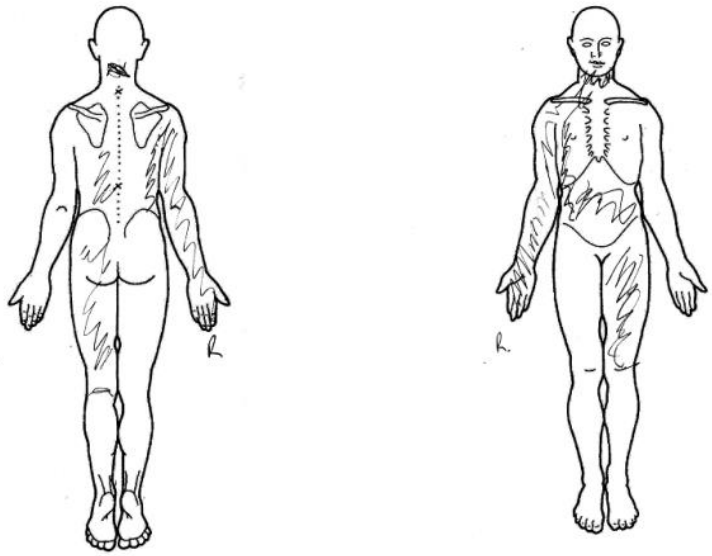


Figure 60. Participant 10 – 5-week follow-up body diagrams

head more in the direction of his reach. The change in strategy was also clear from his descriptions in the body awareness tests. In the preliminary interview, when reaching for an

imaginary cup, he was aware of the right upper arm moving, the hand gripping the cup, his shoulder rotating, his back tightening up to hold himself up so that he didn't fall over and pushing through his right leg ("I would push down on right leg"). In the follow-up interview he had changed his strategy. He was no longer pushing through his right leg (which would have worked counter to reaching to the right) but was pushing through his left leg. He also no longer mentioned tightening up his back but was actually allowing his left buttock to lift. The change in strategy was also a consequence of opening his ribs more which had been a challenge for him as he had pointed out in Week 12. He was also aware of much more of his body being involved in the movement. In his words he was aware of his "fingers, hand, arm, elbow, shoulders, your back, you're actually pushing on one leg, on my left leg, pushing down, lifting your right, left cheek, just about the whole body". Changes in his body awareness can be seen by comparing Figure 59 and Figure 60.

Symptom control.

He thought that over the course of the programme his pain and fatigue had decreased. Prior to the programme he found that his back used to get really tired and sore but he found that since doing the programme, the pain and fatigue had been less.

> Over the course of, and I'll give you the credit, my back used to get really, really tired and I've noticed in the last, oh I don't know four weeks, that it's not actually getting as sore as it used to. Cos the back muscles used to get very, very tired, especially if I was walking any distance or anything, or standing for any period of time. And while it still happens it's not as bad as it was, cos I used to wake up in the morning and go, 'Oh sore back', but it hasn't been happening, but yet I've been quite active and doing some

walking and things like that, you know, and a fair amount of exercise and it hasn't been happening (follow-up interview).

His pain interference results illustrate an increase in pain interference during baseline and a drop in pain interference during the programme to below baseline levels. In his follow-up interview he stated that this was accurate. However his average pain intensity results did not indicate improvement.

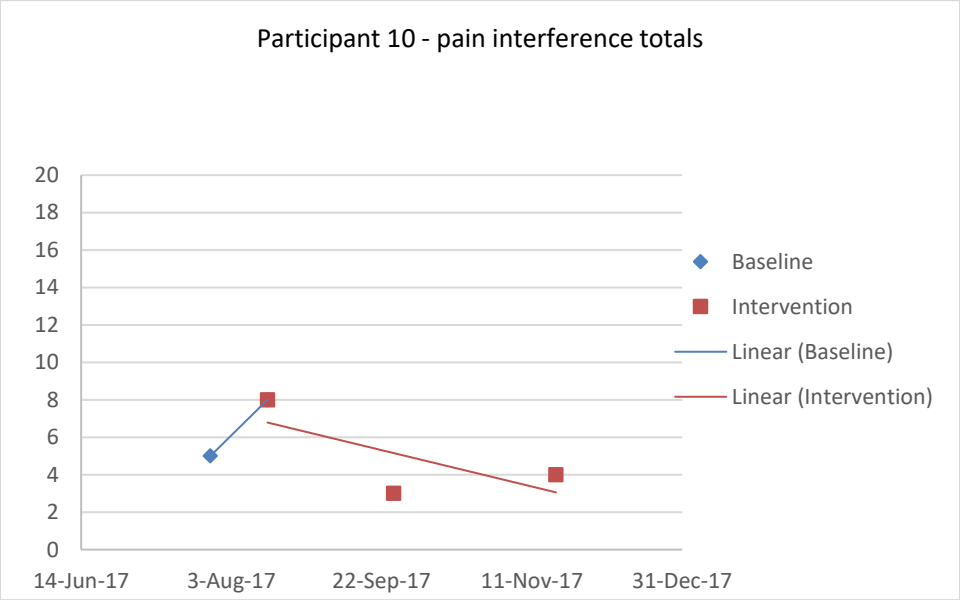


Figure 61. Graph illustrating Participant 10's pain interference totals

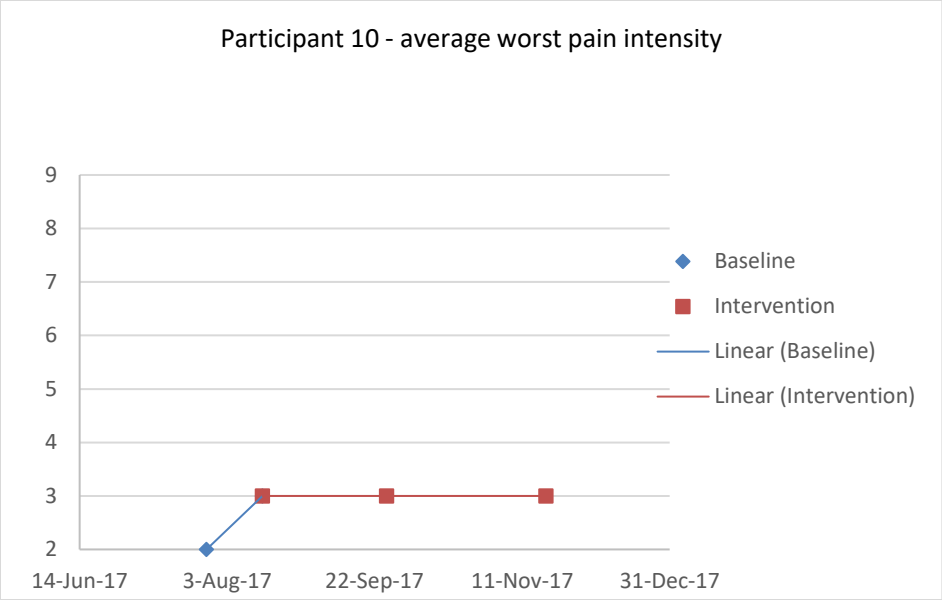


Figure 62. Graph illustrating Participant 10's average worst pain intensity

His fatigue results suggest a decrease in fatigue at baseline and an increase during the programme. However he didn't think that the variances in fatigue were an indication that the programme had increased his fatigue. In fact he thought it was more likely that the programme decreased his fatigue "No I think that might've been just that day…if anything I would've thought my fatigue would've gone down" (follow-up interview).

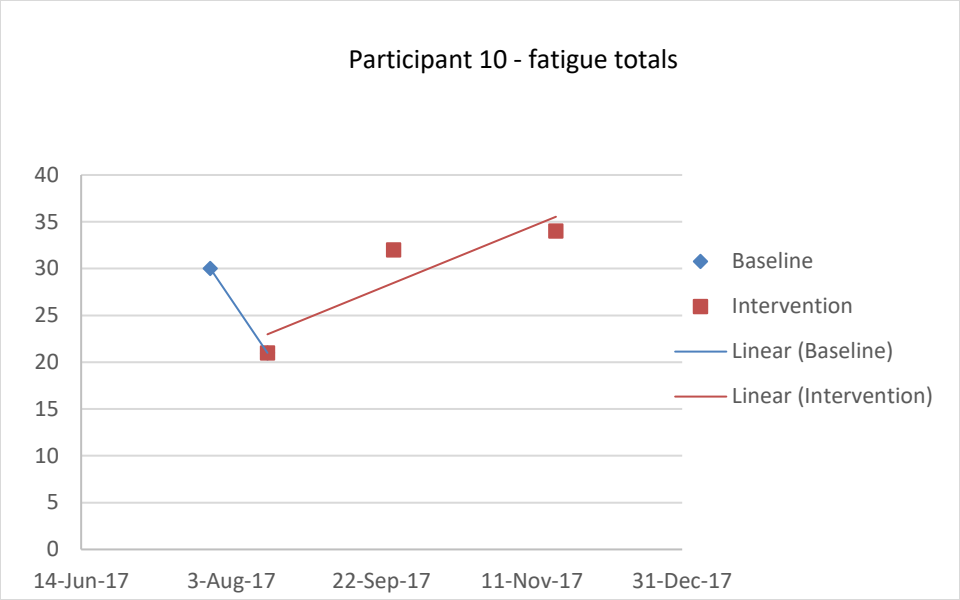


Figure 63. Graph illustrating Participant 10's fatigue totals

He believed that continuing to use what he had learnt on the programme could influence his pain, spasticity, fatigue and ease of movement and felt that he now had more control over his "destiny":

> which is partly educational I think, because you come in and you go, 'Oh no, my lots my lot', and then you know, you start doing things like this and you go, 'Oh actually no', you do have more control over your destiny (follow-up interview).

This increase in personal control is reflected in his IPQ results (see Figure 64) where there was a slight decrease at baseline and a marked increase during the programme. He thought that the IPQ test results represented his experience (follow-up interview).

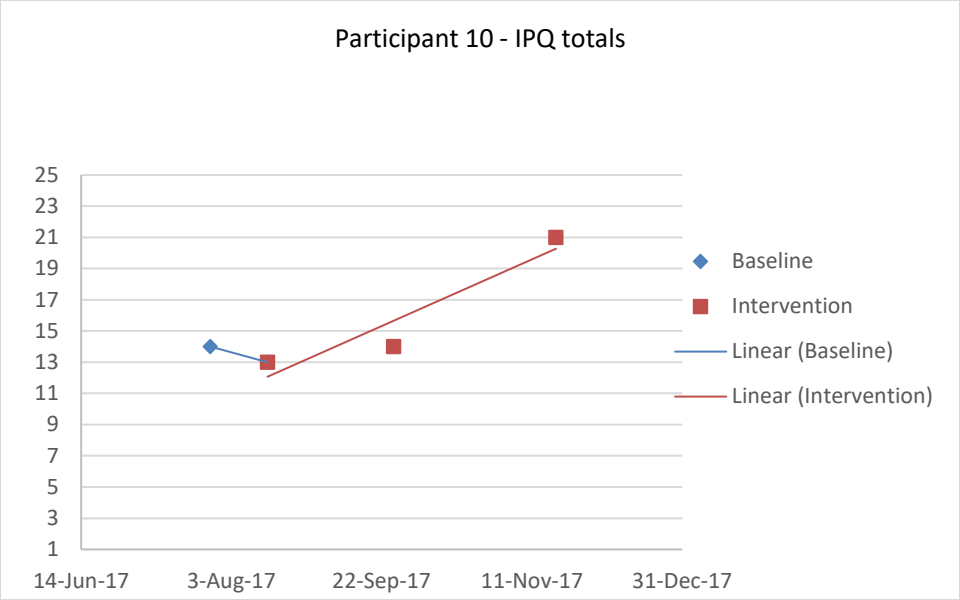


Figure 64. Graph illustrating Participant 10's IPQ totals

Knowledge and skills.

He thought that his improvements were due to approaching things differently; looking at easier ways of doing things. “Is there another way” had become part of his thinking.

> It makes you think about doing things differently which is a big thing because after 30 odd years or whatever your very much entrenched in how you do things and certain muscles are compensating for others and things like that so it’s taking steps backwards to be able to move forward (Week 12).

He also felt that the lessons were lengthening the muscles “the exercises tend to lengthen the muscles and things like that, so you become more flexible and you can do it” (follow-up interview).

Attitude to programme.

Personal value.

He found the course "thought-provoking and educational" (Week 10) and recognised that what they were learning on the programme was the tip of the iceberg "I was just wondering whether 12 weeks was a very abridged short version…It seems to me like we're just scratching the surface" (Week 12). He thought the benefits would be felt if one practised beyond the programme: "it's the long game" (Week 7).

He particularly appreciated the lessons that focused on the pelvic floor and hip joints which he found "really good".

> For me it's quite good because it's on bits that never get thrashed or and that strong or whatever - the lower back, the hips, the pelvic floor and that whole sort of from here down [pointing to his hip joints and down the legs] (Week 7).

He felt however that a lot of what he had done had addressed his sitting balance whereas he was more interested in addressing his standing balance and hoped to focus sometime in the future on working more with his walking.

> Cos most of what we were doing was core and trunk stuff…while this would help in how I approach some things, the ease of movement is going to come from my walking and back fatigue and things like that…Maybe somewhere where I wanna look at in the future (follow-up interview).

He enjoyed the social interaction and hearing other participants' stories. "I don't tend to see many people that have gone through a similar experience, so it's always quite interesting" (follow-up interview).

During the programme he said that he valued having the homework files as resources for the future when he might do some lessons at home. He felt that the more you practised the more you got out of it "the hardest bit is I'm sure you get more out of it the more times you do between and that's the hard bit" (Week 7). At follow-up he stated that he found the homework "good". "I'd just have it playing and I could just lie on the floor and do whatever I needed to do, which was good". He hoped to do more of the lessons at home in the future and was keen to have a look at the videos.

One of the difficulties with doing the homework was "you're not quite sure if you're doing it right". He thought that it would have been useful to have more visuals in the homework.

> Yeah, sometimes I do think the homework would've been easier to know you were doing it right, if it had been audio-visual rather than just audio. So you could actually see what you were doing cos at one stage I was doing something and then you said, 'Oh, on your left leg, or do this' and I went 'Oh, I've been doing it wrong the whole time' (follow-up interview).

He thought that he would continue to explore using the **Feldenkrais Method** in the future if he could be provided with lessons that specifically targeted his needs. "I'd like some direction" "it's just about someone with the knowledge saying actually 'I think this one would be good for you" (follow-up interview). "There's a fine balance between discovering yourself and someone actually helping you discover it" (Week 5).

He requested advice on lessons for him to do over the summer months while he was away and thought that he could also be interested in attending classes in the future, depending on what he was up to at the time.

Relevance to others.

He thought that one of the benefits of the programme was that it got people realising that sometimes they had more potential than they thought they had.

> It gets people thinking, not falsely, but thinking that what you've got is not necessarily what you need to put up with or have, so it actually gets you thinking. It's not just the physical things but it's the mental things as well…not necessarily seeing things as concrete barriers, so you know, things aren't necessarily always set in stone so things can change (follow-up interview).

Future considerations.

He felt that the range of abilities that I had in the class made it quite challenging to teach and that it would be useful to work with a narrower range of people.

> The range of people that you had with the range of movement I think made it quite hard for you…in a perfect world you'd probably say, 'Right, I wanna target this group of people and that group of people', and stuff like that. I do have some empathy for you trying to teach all of, an unruly lot (follow-up interview).

He also felt it would have been useful to let individuals know exactly which lessons were relevant to them "certain exercises or lessons, however you refer to them, is probably more pertinent or appropriate for certain people, so you might say, 'Look actually [Participant 10] if I was you, and I think this might help you, if you did three, eight, and ten" (follow-up interview).

Group Findings

In this section I will present the data on group participation in the study, the quantitative baseline data and finally my findings based upon the grouped qualitative and quantitative results.

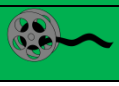
Quantitative data will be presented with the aid of modified Brinley plots. A modified Brinley plot is a scatterplot which is used to compare individual participant's scores on the same dependent variable at selected times throughout treatment. Usually the baseline scores are on the *x*-axis and treatment scores are on the *y*-axis. The axes of the Brinley plots have the same origin and scale values so, if there is little or no change, individual data points lie closely around the diagonal. Modified Brinley plots enable one to see if outcomes are replicated. Systematic movement of points above or below the diagonal illustrate whether or not there has been improvement or deterioration for participants (Blampied, 2017).

For each of the quantitative variables I established whether or not the data were stable at baseline by plotting two baseline data points as a Brinley plot and evaluating whether or not the points were evenly spread around the diagonal. I then took the average of the two baseline values and plotted the average baseline measure against measures at points throughout the intervention. As at times participants did not complete the whole questionnaire so some of the data points were missing. To remedy this it was necessary to make substitutions which I have outlined throughout this section.

Group participation.

Figure 65 shows which classes each of the participants attended; participants attended between six and eight classes. I was initially concerned about the poor attendance so I

	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10
1			Sprained ankle, couldn't drive		

					
2					In Auckland
3	Infection			Dealing with builder	
4		Had a fall and twisted knee			On holiday
5		Not recovered from twisted knee	Sick 	In a meeting	
6		In hospital			
7 catch up class	Personal crisis	Houston to help father	Pain flare-up due to gardening 		
8		Houston		In a meeting	
9	I was sick so class was cancelled				
10	Personal commitment		Recovering from surgery 		Had a cold
11					
12	In New York			Overseas	

Key:

Present

 Borrowed video of that session

Figure 65. Lessons participants attended and reasons for nonparticipation

organised an optional catch up class in Week 7; a week that was initially scheduled to be a break. However, only two people were able to attend. I expressed my concerns about the poor attendance to one of the physical education students and wondered whether it was a reflection of the programme. However he said that he felt that the feedback they were giving me indicated that they were getting benefits. I also texted my concerns about attendance to a colleague with SCI who replied “people with SCI are notorious for sudden issues, plus new Zealanders are far too busy and take on too much... Not helped by ACC and their 'targets'”.

Figure 66 shows which of the online homework resources participants accessed throughout the programme and how many times they accessed them.

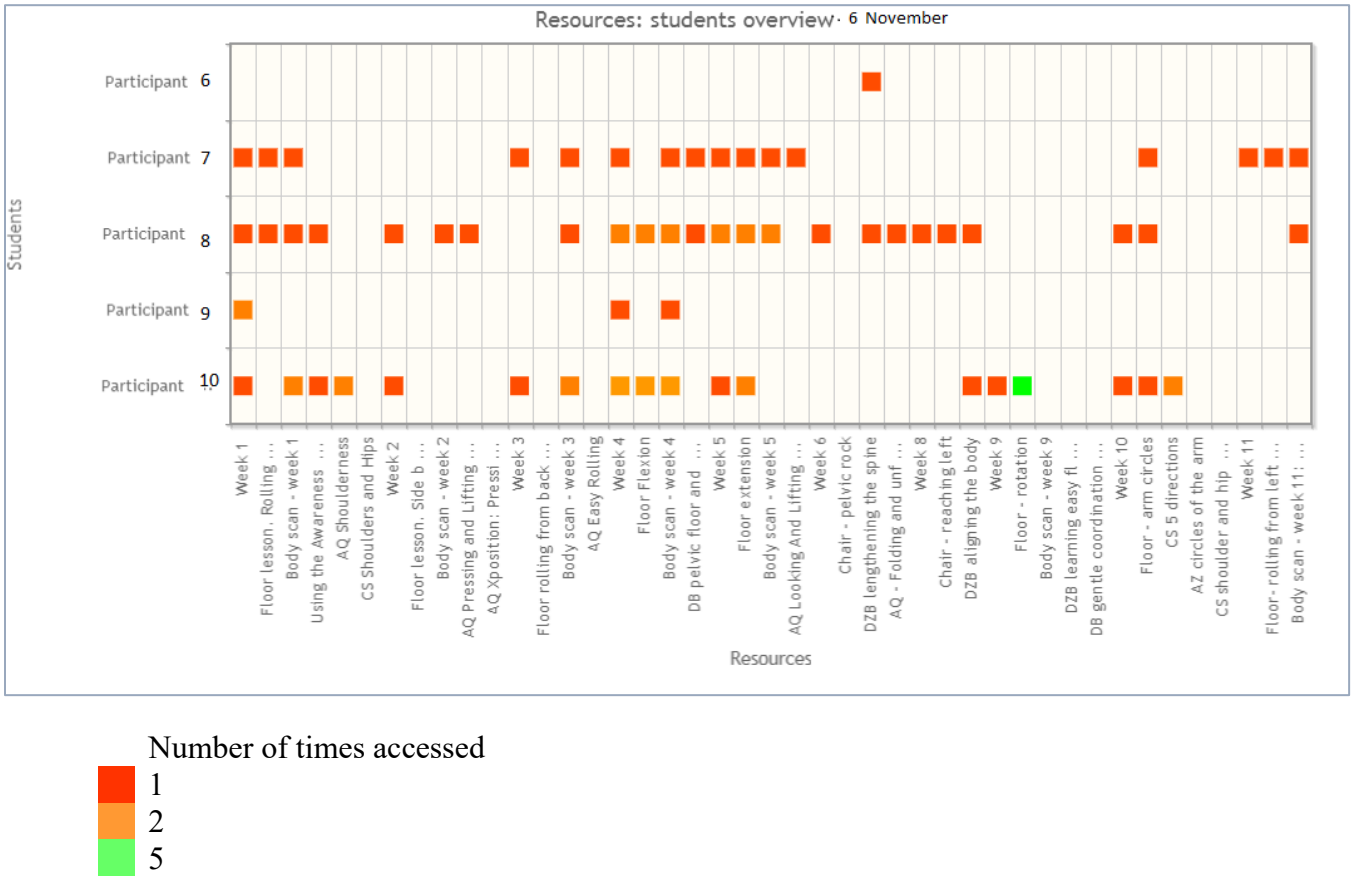


Figure 66. Resources accessed throughout the programme

Baseline data.

In this section I will present the baseline data for each of the quantitative variables. The average baseline for each of the variables can then be used for comparison against the intervention data to establish whether or not there is evidence of change.

Baseline reach tests.

As shown in Figure 67, a relatively stable baseline was established for two participants in the lateral reach left test. This is indicated by the fact that two of the square data points sit on or close to the diagonal line. (Data points that sit on the diagonal line indicate no change.) At the

end of baseline there was a slight decrease for two of the other participants (indicated by the fact that the points fall below the diagonal line) and an increase for one participant (indicated by the fact that the data point falls above the diagonal line).

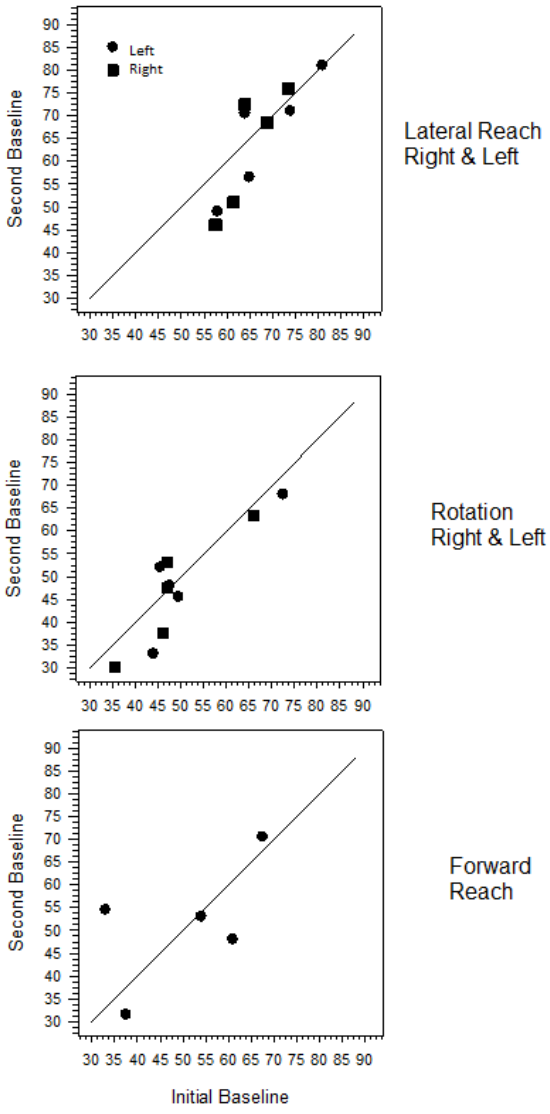


Figure 67. Comparing the two baseline measures (in cm) for the forward reach, lateral reach and rotation tests

The baseline results for the lateral reach right test were similar with two data points falling close to the diagonal, one increasing slightly and two decreasing. For the rotation left test, a stable baseline was established for one participant, whereas three decreased slightly and one increased slightly. Again the baseline results were similar for the rotation right test where the

baseline remained stable for one participant, three participants decreased slightly and one increased slightly. For the forward reach test, the results were spread reasonably evenly around the diagonal with one participant maintaining a relatively stable baseline, two participants increasing and two decreasing. In summary there was a relatively even spread of results around the diagonal (indicating an overall relatively stable baseline) for most of the tests with more of a tendency to decrease by the end of baseline. The baseline results for the upward reach test (see Figure 68) show that a relatively stable baseline was reached for four of the participants, but one participant had decreased significantly by the second baseline.

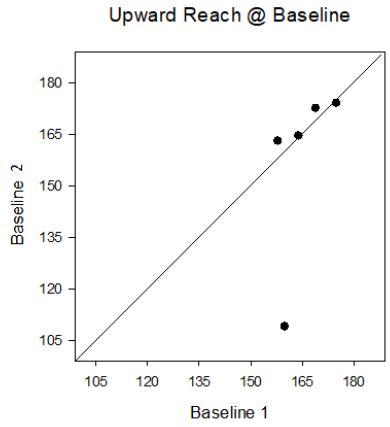


Figure 68. Comparing the two baseline measures (in cm) for the upward reach test

Baseline perceived exertion.

Perceived exertion was divided into perceived exertion in movement and perceived exertion in function (derived from the questions on page 169). As shown in Figure 69, the total perceived exertion in movement scores ranged from 56 to 117 out of a possible range of 42 (no exertion) to 140 (maximal exertion).[4] For four of the participants the total perceived exertion had decreased slightly by the end of baseline but for one it had increased.[5]

[4] Note that 1st baseline data were missing for Participant 9 so the 2nd baseline data were used instead.
[5] For participant 7, Week 6 perceived exertion in movement data were missing so Week 5 data were used instead.

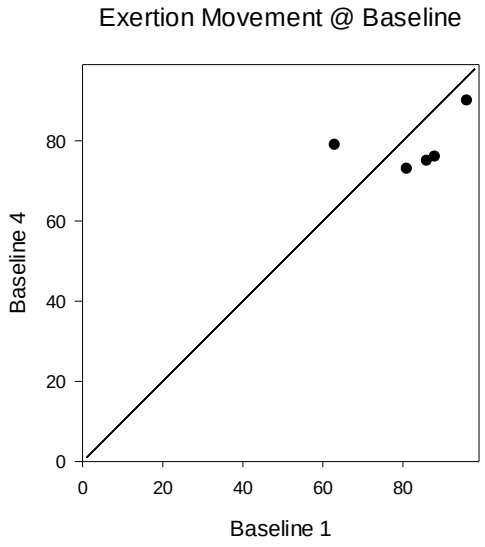


Figure 69. Comparing the first and last baseline measures for totals of the perceived exertion movement tests

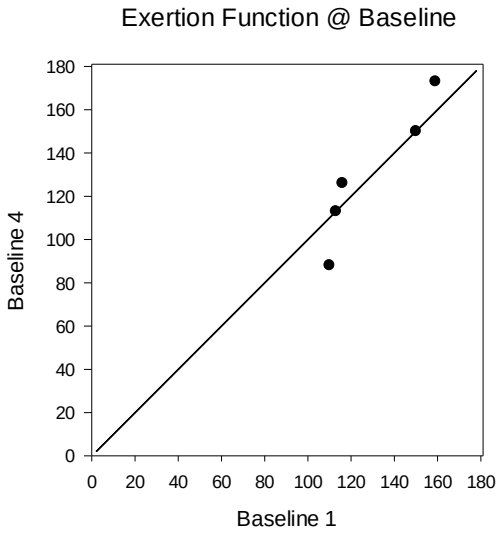


Figure 70. Comparing the first and last baseline measures for totals of the perceived exertion in function tests

Some data points were missing for exertion in function and so the following substitutions were made. For Participant 8, "Rotating as if to put your wheelchair in your car" Baseline 4 score was substituted with the Baseline 1 score of 13. For Participant 9, the "Walking" Baseline 1 score was substituted with the Baseline score of 6 and the "Rotating as if to put your wheelchair in your car" Baseline 4 score was substituted with the Baseline 1 score of 13. For

Participant 10, the “Rotating as if to put your wheelchair in your car”, Baseline 4 score was substituted with the Baseline 1 score of 11 and the Baseline 1 score was substituted with the Baseline 4 score of 13.

As can be seen from Figure 70, the data points for total perceived exertion in function ranged from around 80 to 170 out of a possible range of 66 (no exertion) to 220 (maximal exertion). They were relatively evenly spread around the diagonal at baseline with data for two participants remaining stable, two participants demonstrating an increase in perceived exertion by the end of baseline and one showing a decrease in perceived exertion.

Baseline pain.

Figure 71 illustrates that, at baseline, pain interference scores ranged from around 5 to 18 out of a possible range of 0 to18. For one participant (the one that reported the most pain interference), pain interference remained relatively stable and high throughout baseline. For 1 participant there had been a slight decrease in pain interference by the end of baseline whereas for three participants there had been an increase.

The worst pain scores ranged from around 2 to 9 out of a possible range of 0 to10 (see Figure 72). A relatively stable baseline was established for worst pain with three participants’ scores remaining on the diagonal (showing no change) and two participants showing a slight increase in pain.

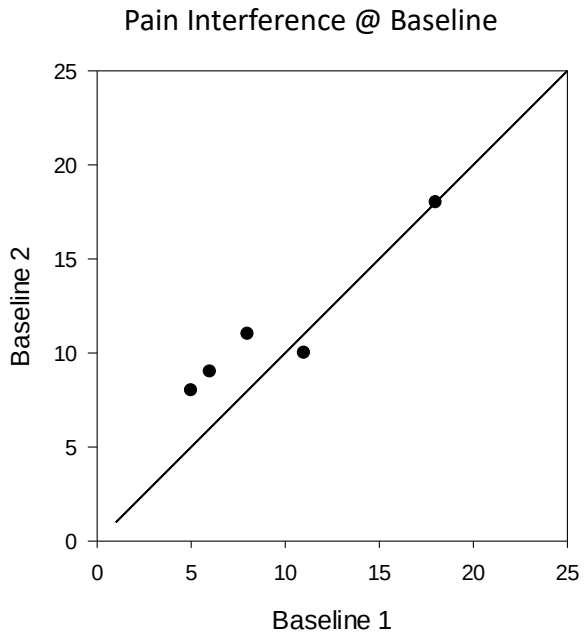


Figure 71. Comparing the two baseline measures for pain interference totals

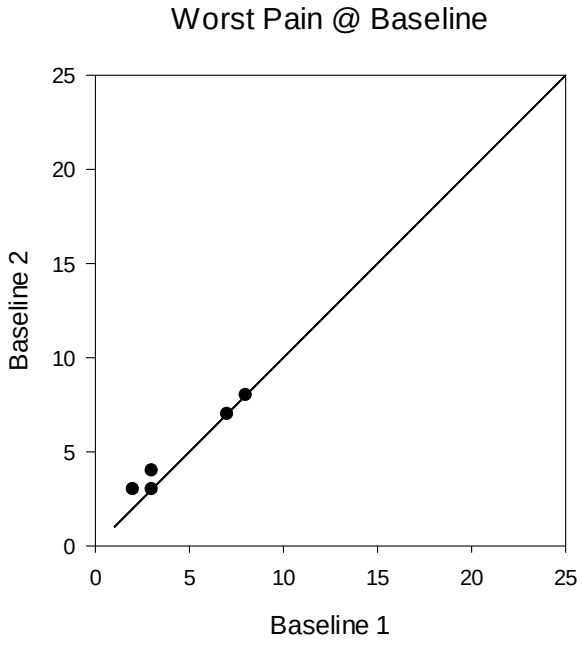


Figure 72. A comparison between the two baseline measures for worst pain

Baseline impact of fatigue.

Figure 73 illustrates that the baseline fatigue scores ranged from 4 to 49 out of a possible range of 0 to 49. Although a relatively stable baseline was achieved for three of the participants,

for one there was a decrease in fatigue by the end of baseline and for another there was an increase.

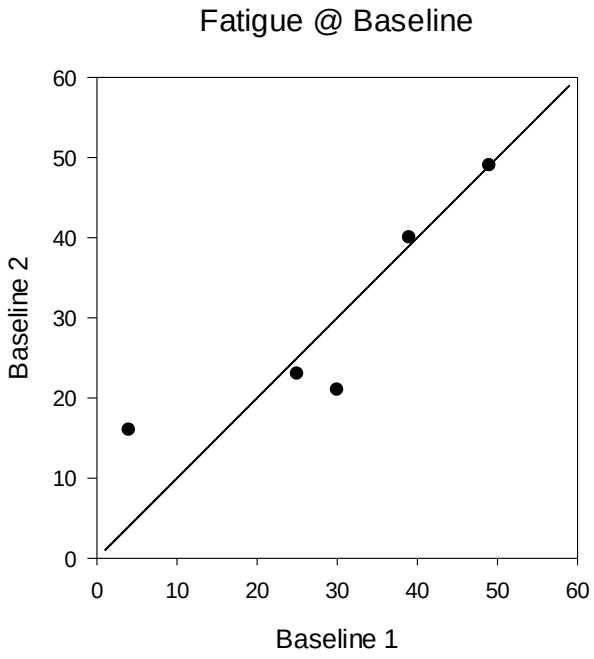


Figure 73. Comparing the two baseline measures for fatigue

Baseline Illness Perception Questionnaire.

The IPQ baseline measures (see Figure 74) ranged from 3 to 23 out of a possible score of -10 to 26. Two participants' scores remained close to the diagonal (i.e., a relatively stable baseline), two participants had shown an increase by the end of baseline whereas one had shown a decrease indicating that overall a stable baseline had not been reached for most participants.

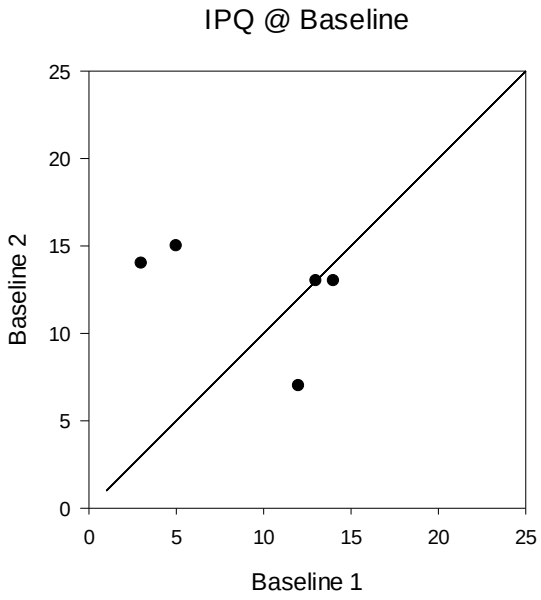


Figure 74. Comparing the two baseline measures for the IPQ

1. What effect did the programme have on postural stability, ease of movement and function, body awareness and movement strategies?

All participants reported positive changes in postural stability, ease of movement and function, body awareness and movement strategies. Two participants were unable to get into the chairs unassisted at the beginning of the programme but were able to do so at the end. This was consistent with the quantitative findings as outlined below.

Postural stability.

All five participants reported positive changes in postural stability during the programme. For example after many of the ATMs participants noticed improvements in reach ("I can go further", Participant 6, Week 5), posture and balance ("I feel like straighter and more balanced". Participant 8, Week 6) which for a couple of participants at least (Participants 6 and 9) were maintained on the drive home after the lessons. These findings are consistent with the quantitative results whereby all participants demonstrated improvements in the seated reach test during the programme.

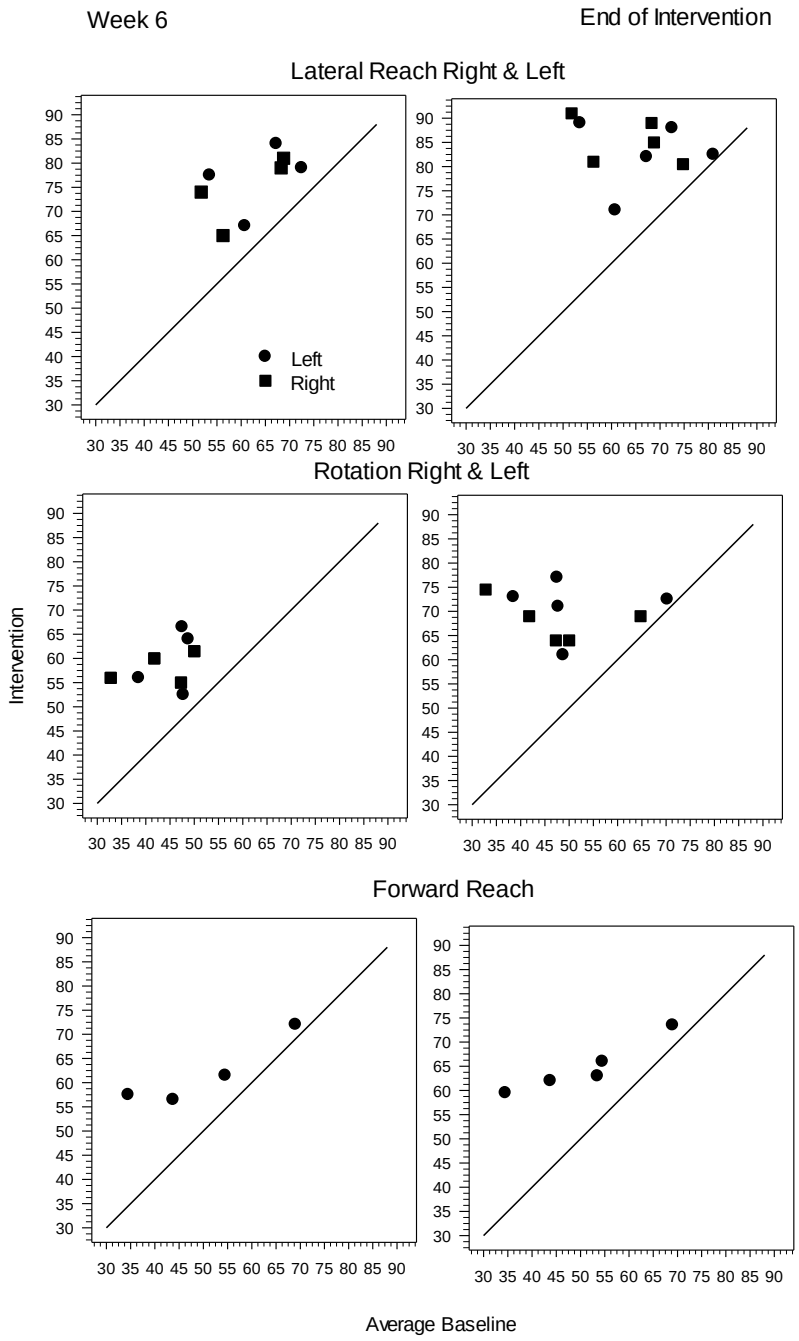


Figure 75. Comparing the average baseline forward reach, lateral reach and rotation measures (in cm) to measures in Week 6 and the end of the intervention

Figure 75 and Figure 76 illustrate that all participants were performing better compared to the average baseline on all seated reach and rotation measures both at Week 6[6] and at the end

[6] As Participant 7 was overseas there were no seated reach and rotation results for her in Week 6.

of the intervention with the improvement at the end of the intervention being generally greater than shown at Week 6.

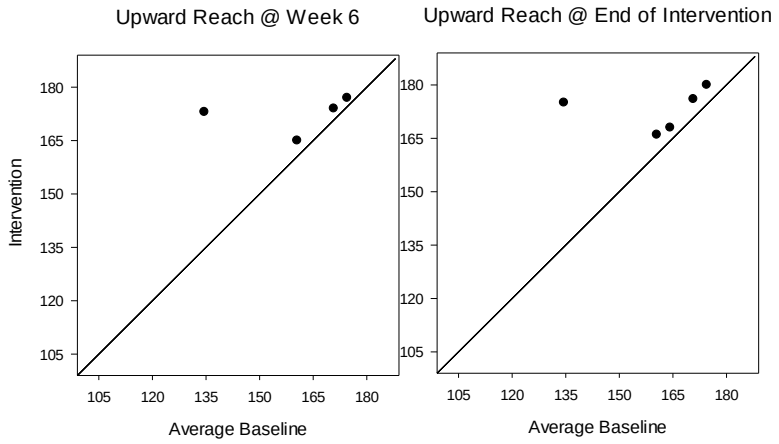


Figure 76. Comparing the average baseline upward reach measures (in cm) to measures in Week 6 and the end of the intervention

I was only able to find one SCI study using traditional rehabilitation against which I could compare the seated reach results. In the study by Boswell-Ruys, Harvey, Barker, et al. (2010) of 18 sessions of task specific training, one of the measures of change was the seated reach test, 45° to the right, where change was measured as a percent of arm length. They estimated that a minimally worthwhile treatment effect was 10% of arm length whereas the between-group mean difference was 8%, with a range of 3 to 13%. Table 3 illustrates how much change participants achieved as a percentage of arm length (from the acromion to the tips of the fingers) in the reach tests. In the lateral reach right test in Phase 3 of my study, one participant had improved by 11% of arm length by the end of the intervention whereas the rest of the participants' improvements were in excess of 30% of arm length, reaching as high as 53%. At follow-up, four of the participants' improvements still exceeded 10% with one participant still exceeding 50% at three month follow-up.

Table 3. Improvements in reach as a percent of arm length

Improvements in reach as a percent of arm length								
	Post intervention (compared to baseline)				*Follow-up (compared to baseline)*			
Ppt	**Right**	**Left**	**Forward**	**Upward**	**Right**	**Left**	**Forward**	**Upward**
6	32	29	36	10	16	16	33	11
7	11	3	18	4	3	6	13	3
8	53	48	34	41	50	42	33	58
9	33	14	15	7	22	4	8	6
10	36	27	8	9	24	18	8	9

Although there were some differences between the measurements Boswell-Ruys, Harvey, Barker, et al. (2010) used and the measurements I used, a comparison of these results to the minimally worthwhile treatment effect determined by Boswell-Ruys, Harvey, Barker, et al. (2010) suggests that my participants' improvements may be significant. My test was a modification of the test they used as described in Chapter 6. My participants reached laterally to the right (not 45°) and my strategy for measuring arm length was more conservative than theirs. Whereas they measured arm length from the acromion process to the thumb web space, I measured arm length from the acromion to the tips of the fingers. However it is unlikely that that would have significantly influenced the percentage change in reach. Had I used their test, the resulting figures in my study would have been higher. As they did not measure the change in other directions for this study, it was not possible to make a more direct comparison. However the changes achieved in my study are in excess of the minimally worthwhile treatment effect for all of my participants (and well in excess for four participants).

Ease of movement and function.

Throughout the programme all five participants reported improved ease of movement after the ATM's ("yeah looking ups a lot easier", "hugely different", Participant 6, Week 6), ("when we started, reaching over I could barely touch the ground. In the end I could reach my whole hand over there without really straining", Participant 10, Week 3). At times they identified

changes in strategy which led to these improvements ("when I changed what I was trying to do rather than moving the arm but moving the body, the ribs, you're not using that muscle in that same movement and it makes it a lot easier", Participant 7, Week 11).

For the most part these findings are consistent with the quantitative results whereby four participants showed improvements (with Participant 6 showing no change) in perceived exertion in movement. By Week 6, four of the participants had had a decrease in perceived exertion compared to the average baseline and by the end of the intervention all participants demonstrated a decrease in perceived exertion compared to the average baseline (see Figure 77).

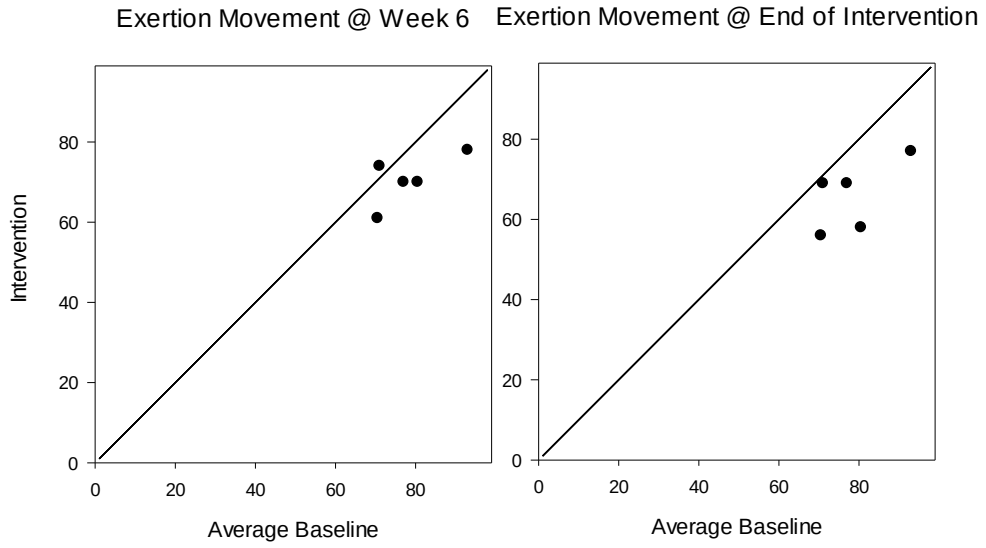


Figure 77. Comparing the average baseline (first and last baseline measures in cm) perceived exertion in movement totals to totals in Week 6 and the end of the intervention

All participants reported incidents of function becoming easier. For example Participant 6 found it easier to wheel his wheelchair ("I find using the wheelchair a lot easier now, going up ramps and stuff"), Participant 8 found it easy to roll over in bed and Participant 9 learnt to move from the floor into his wheelchair. For the most part these findings are consistent with the

quantitative results whereby four participants showed improvements (with Participant 6 showing no change) in perceived exertion in function.

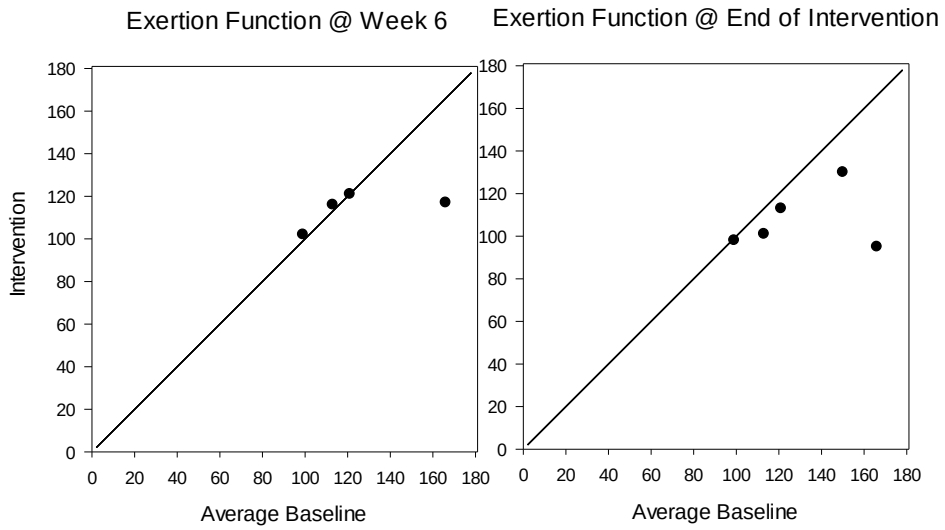


Figure 78. Comparing the average baseline perceived exertion in function totals to totals in Week 6 and the end of the intervention

As some data points were missing for exertion in function the following substitutions were made. For Participant 9, the "Standing" Intervention Week 12 score was substituted with the Intervention Week 6 score of 19. For Participant 10, the "Rotating as if to put your wheelchair in your car" Intervention Week 12 score was substituted with the Intervention Week 6 score of 8. As Participant 7 did not have access to the Internet during Week 6 and so did not complete any of the tests at this time, no results were recorded for her in Week 6.

At Week 6 (see Figure 78), three participants' scores were very close to the average baseline scores with one showing a significant decrease. By the end of the intervention, one participant's score demonstrated no change since baseline whereas the other four participants showed a decrease.

Despite the relative consistency between the quantitative and qualitative results, there were some issues in completing the quantitative tests. Some of the questions were appropriate for

some, but not all participants. For example, Participant 10 found the weekly perceived exertion in movement questionnaires too easy for him. Participant 6 felt that as movement became easier, he was tougher in how he rated it (see page 189).

Body awareness and movement strategies

Participants also observed changes in how they were sensing and moving after the ATMs. For example Participant 6 and 8 had become more aware of their pelvises. For Participant 6 this meant that he was able to push his wheelchair faster. He was "getting a better drive with the push" (follow-up interview). Participants 7, 9 and 10 found that learning to rotate made a big difference. For Participant 7 this had "a huge impact" (follow-up interview), for Participant 9 it gave him "a strategy, strength" for getting into his wheelchair from the floor (follow-up interview) and for Participant 10 it enabled him to do a lot more. Participants 7, 8 and 9 found that they were more aware of their breathing and movement became easier when they paid attention to the breath. Participant 8 became aware of how opening the ribs enabled her to reach further Participant 7 found that she had also "totally" changed the way she climbed the stairs "it's not just lifting my foot up onto the step, you know, it's the whole movement" (follow-up interview).

Changes in sensing and moving were demonstrated in the body awareness test with changes varying from minor changes for Participant 9 (Figure 79 and Figure 80) through to major changes for Participant 6 (Figure 81 and Figure 82).

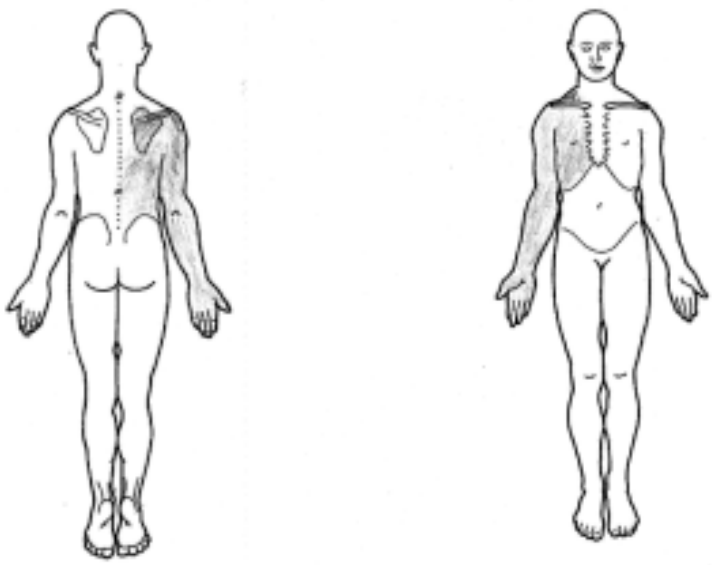


Figure 79. Participant 9 - Pre-intervention body diagrams

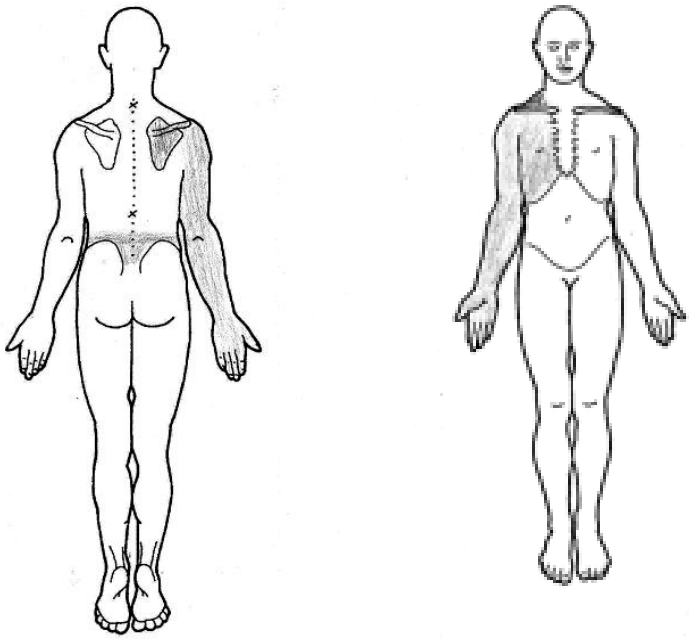


Figure 80. Participant 9 – 3½-month follow-up body diagrams

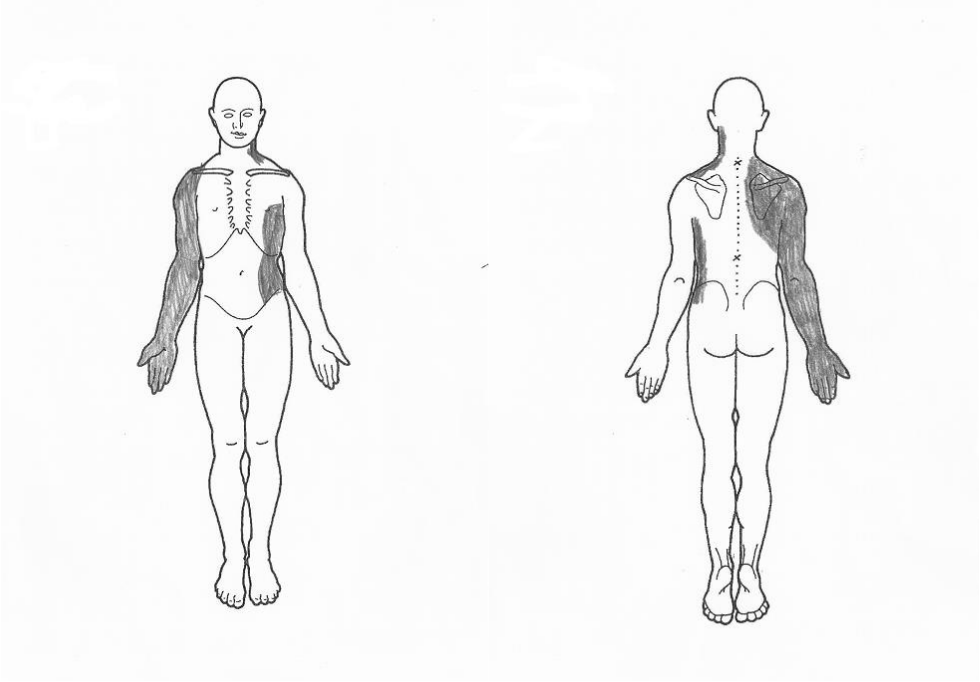


Figure 81. Participant 6 - Pre-intervention body diagrams

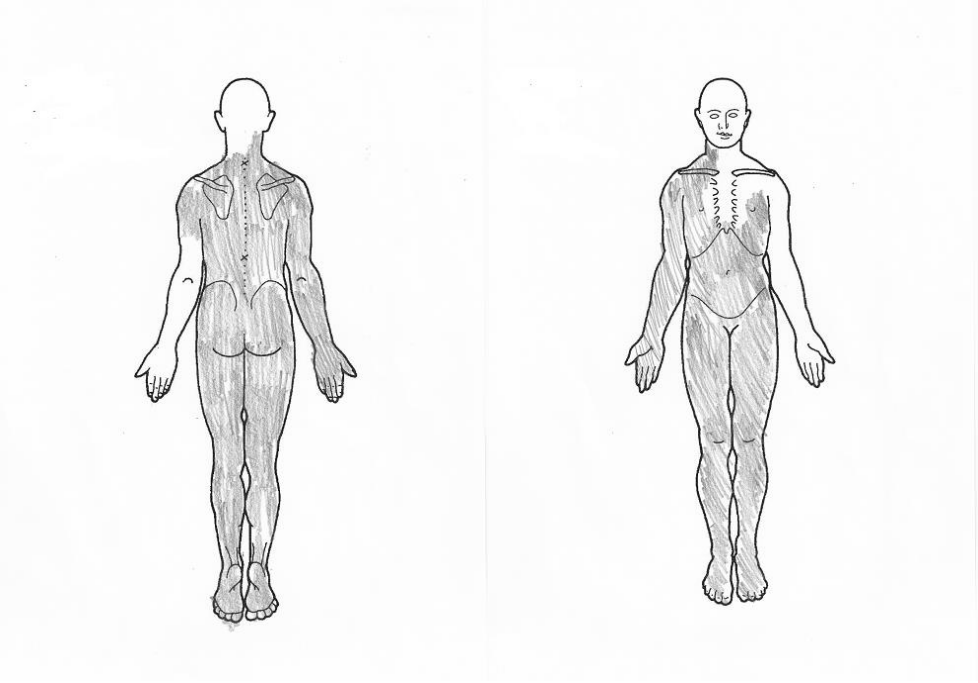


Figure 82. Participant 6 – 1-month follow-up body diagrams

2. What effect did the programme have on symptom control?

The symptom results included data on pain, spasticity, fatigue and IPQ (which evaluated the extent to which participants felt they could control the symptoms). Whereas on the whole

participants did not appear to have a significant influence on symptoms during the programme, four participants noticed reductions in pain after at least one of the lessons, three participants reported reductions in spasticity (for two, spasticity was not an issue), one reported reductions in fatigue and all participants reported improvements in their ability to control symptoms. This was not always consistent with the quantitative results. However participants stated that there were many variables that could have influenced the quantitative evaluation of their symptoms such as activities outside the programme, the weather or their changing perceptions as they completed the questionnaires. As these variables were only measured four times throughout baseline and the programme it was not possible to draw any conclusions from the results.

Another reason for the discrepancy between the quantitative and qualitative results in symptom questionnaires could be attributed to difficulties participants had in completing the questionnaires. For example, although Participant 10 found the ease of movement questionnaires relatively easy to complete, he expressed difficulty with the symptom questionnaires "the ones that we do every week, they're easy, straightforward, the ones where you've gotta rate your pain or stuff like that take a little bit more thought" (Participant 10, Week 8). Participant 9 felt that it was likely that all participants had difficulty completing the questionnaires "I was thinking it was so tricky for everyone because I was thinking it would probably be strongly agree, disagree, you know maybe, moderate, you know what I mean? But basically, it was a lot of answers and you're thinking, like 'Oh ok, yeah that doesn't affect me', you know, it does" (Participant 9, follow-up interview).

Pain.

The effect the lessons had on pain varied from participant to participant but on the whole the effect on pain did not seem to be significant. Participant 6 found that "you actually spread

that pain load across and instead of it being acute pain in one area it's probably a lesser pain over more" (follow-up interview). Participant 7 felt that pain was not a major issue for her anyway that did was observe a reduction in pain after at least one of the lessons. Participant 8 often felt pain immediately after the lesson but that pain fell away and movement felt easier "at the end of each class I always felt better" (follow-up interview). Participant 9 found that sometimes the lessons relieved the pain but it tended to come back later. Participant 10 thought that over the course of the programme his pain had decreased. Although the quantitative results showed some decrease in pain interference for four of the participants (thus supporting the qualitative reports), they exhibited no real effect on the intensity of the worst pain. For one participant who a demonstrated a quantitative deterioration in worst pain during the programme this was at odds with his qualitative report which indicated a sustained improvement in pain.

By Week 6 (Figure 83), three participants showed a decrease in pain interference compared to the average baseline whereas one participant still had high levels of pain. By the end of the intervention, one participant had had a slight increase in pain, two participants exhibited a slight decrease and two exhibited a noticeable decrease.

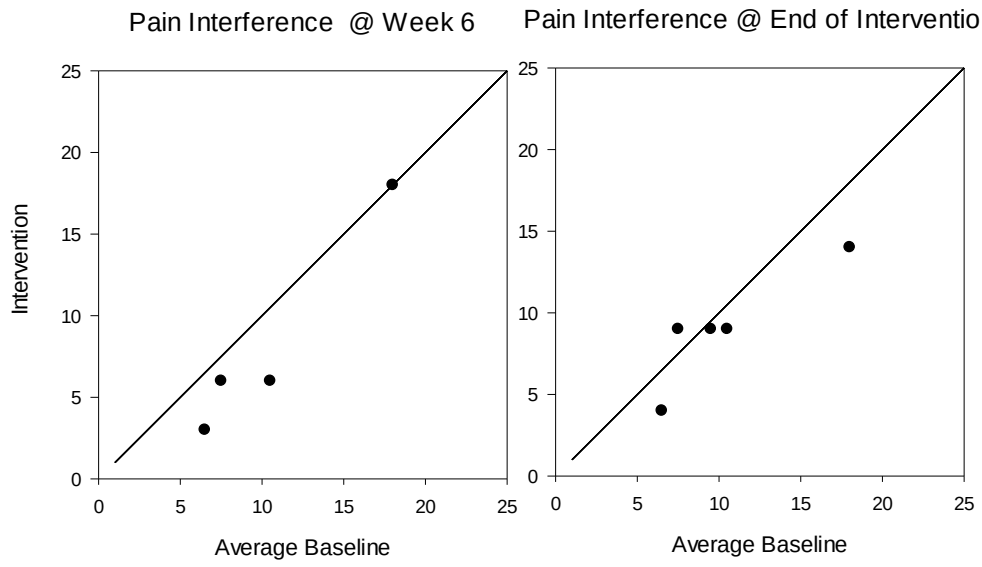


Figure 83. Comparing the average baseline pain interference totals to totals in Week 6 and the end of the intervention

By Week 6 (Figure 84) there had been very little (if any) change in worst pain for any of the participants and by the end of the intervention two participants had shown a slight increase in pain and two participants had shown a slightly larger decrease in pain.

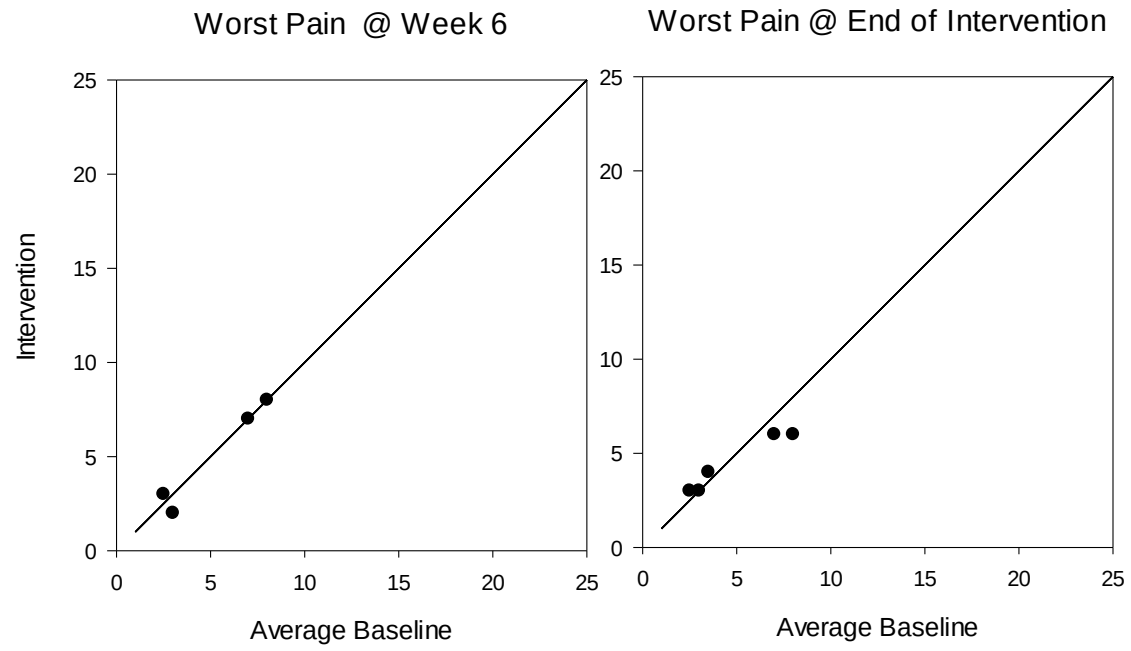


Figure 84. Comparing average baseline worst pain to worst pain in Week 6 and the end of the intervention

Spasticity.

Participants 6, 7 and 9 all reported that some of the ATMs helped them with their spasm. Participants 8 and 10 did not report having an issue with spasm in the first place. Unfortunately I was unable to compare this to the quantitative findings as I didn't have any usable results for the spasticity questionnaires. This was due to a significant difficulty with the questionnaires which came to my attention when reviewing the final results.

The spasticity questionnaire required that they respond to a number of items describing how their spasticity symptoms had affected areas of their life over the previous week. They were required to rate the response from "-3" (extremely problematic) to "+3" (extremely helpful) or not applicable. Items included activities of daily living such as transferring to the bed and feelings such as the feeling of being embarrassed. Whereas it is possible that, at times, spasticity helps with activities such as transferring to the bed, it seems unlikely participants would find spasticity extremely helpful with the feelings of being embarrassed. As I questioned the participants in the follow-up interview, it appeared that there had been some confusion and at times they entered "+3" when they meant "-3". This was made even more ambiguous by the way the response choices were aligned on the Learn website. An example of spasticity response choices is shown in Figure 85. When intending to enter a response of "2+" for example, it was easy for a participant to inadvertently enter a response of "3+". This was more of an issue where a "3+" response could be perceived as "N/A", a neutral response could be perceived as positive and a negative response could be perceived as neutral. This meant that, at times, they rated items as positive when they meant negative. All participants had difficulty with the spasticity questionnaires. For example, Participant 9 indicated the difficulties that he had with completing this questionnaire "It [the programme] did really helps me, even in the shower, and stuff like

that, you know, but to put it here, it becomes a bit too, you know, complicated … spasticity was a bit tricky" (follow up interview).

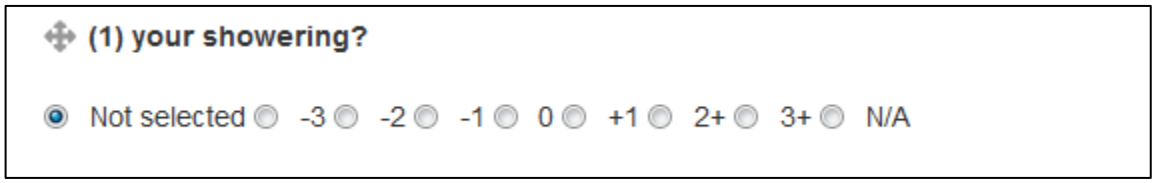


Figure 85. Item 1 on the spasticity questionnaire

Fatigue.

Only one participant, Participant 10, reported a decrease in fatigue. Prior to the programme he found that his back used to get really tired and sore but he found that since doing the programme, the pain and fatigue had been less. According to the quantitative data, by Week 6, three of the participants had shown an increase in fatigue compared to baseline and one had remained stable. By the end of the intervention, two participants had shown a slight increase in fatigue, two had shown a slight decrease whereas one had remained at the baseline level. This suggests that overall the programme had had little impact on fatigue. However there were inconsistencies between the qualitative and quantitative results. For example, Participant 10 reported a decrease in fatigue, yet his quantitative results indicate an increase in fatigue.

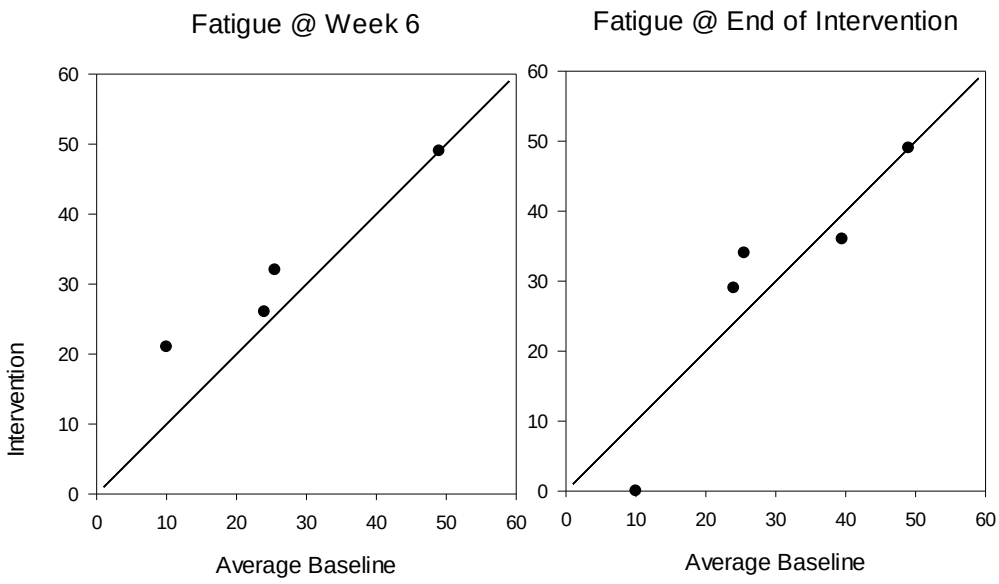


Figure 86. Comparing average baseline fatigue to fatigue in Week 6 and the end of the intervention

Personal control.

All participants reported that they had learned strategies that would improve their ability to manage their condition. However Participant 9 felt that the programme didn't influence his belief that he could control his symptoms as he said he was already very positive in that regard. These findings are relatively consistent with the quantitative findings. At Week 6 (see Figure 87), three participants had shown an increase in the IPQ compared to baseline whereas one had shown a decrease. By the end of the intervention, four participants had shown an increase on the IPQ (with one scoring close to the maximum possible score), one remained close to the baseline and one had decreased slightly.

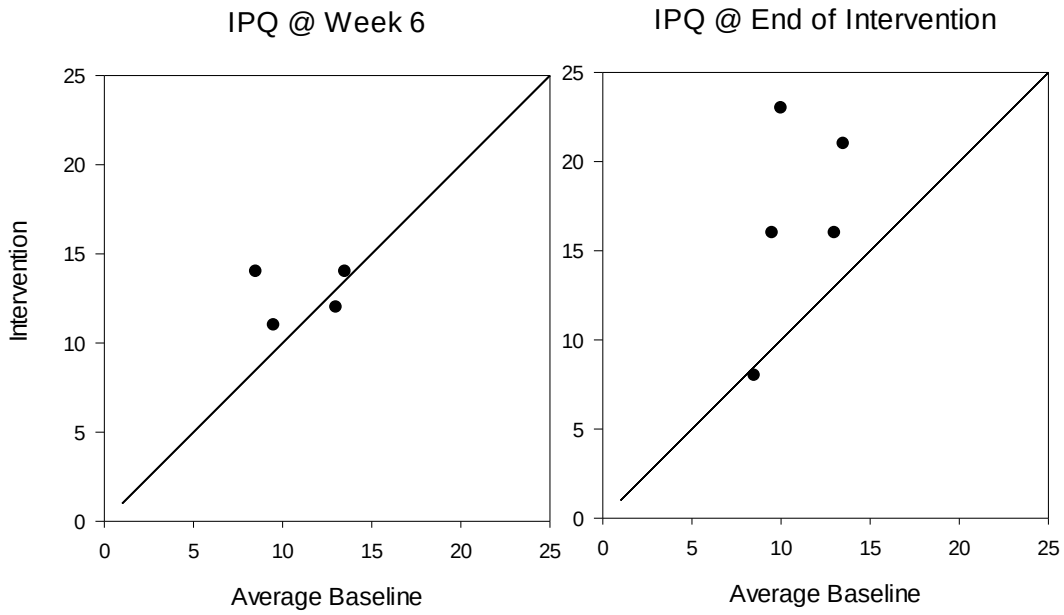


Figure 87. Comparing average baseline IPQ measures to measures in Week 6 and the end of the intervention

3. Was change sustained for the participants?

Participants observed sustained changes both between classes and at follow-up. Participant's 6, 7, 8 and 10 found that improved ease of movement and function was sustained between lessons and at follow-up. For example, during the programme Participant 6 noticed it was easier to pick up basketballs and it made a "huge difference" to the way he wheeled his wheelchair. At one month follow-up this had been sustained. Participant 8 found that improvements in how she rolled over in bed were sustained at follow-up. At follow-up Participants 6 and 7 also stated that their body awareness had improved. Participants 6 reported improvements both above and below his injury level including his legs. He was handling his spasms better and was not having to use as much antispasmodic medication. Participant 7 described how improvements in her ability to climb stairs were sustained one year after the programme. Participant 10 reported that improved posture and reductions in pain and fatigue were sustained at follow-up.

Measures of symptoms and ease of movement were not taken at follow-up. However sustained improvement was consistent with the quantitative seated reach totals which demonstrated that all participants had maintained increased seated reach. For all participants seated reach at 3 week to 3½ month follow-up exceeded baseline measures (see Figure 88 to Figure 92).

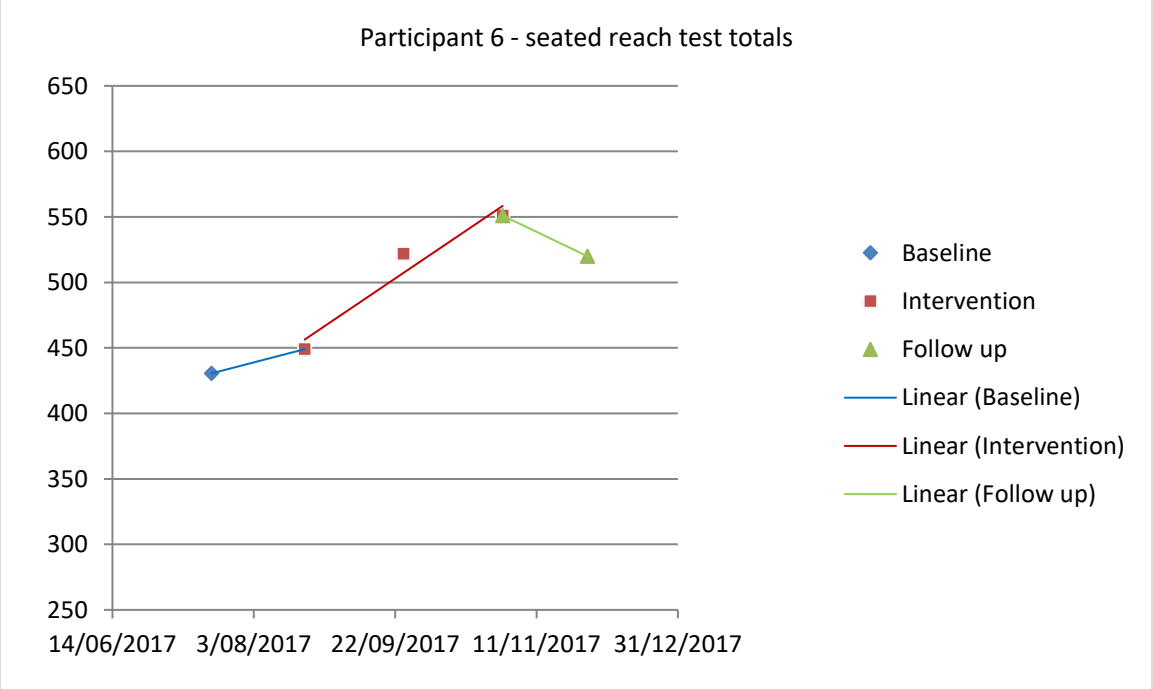


Figure 88. Graph illustrating Participant 6's seated reach test totals

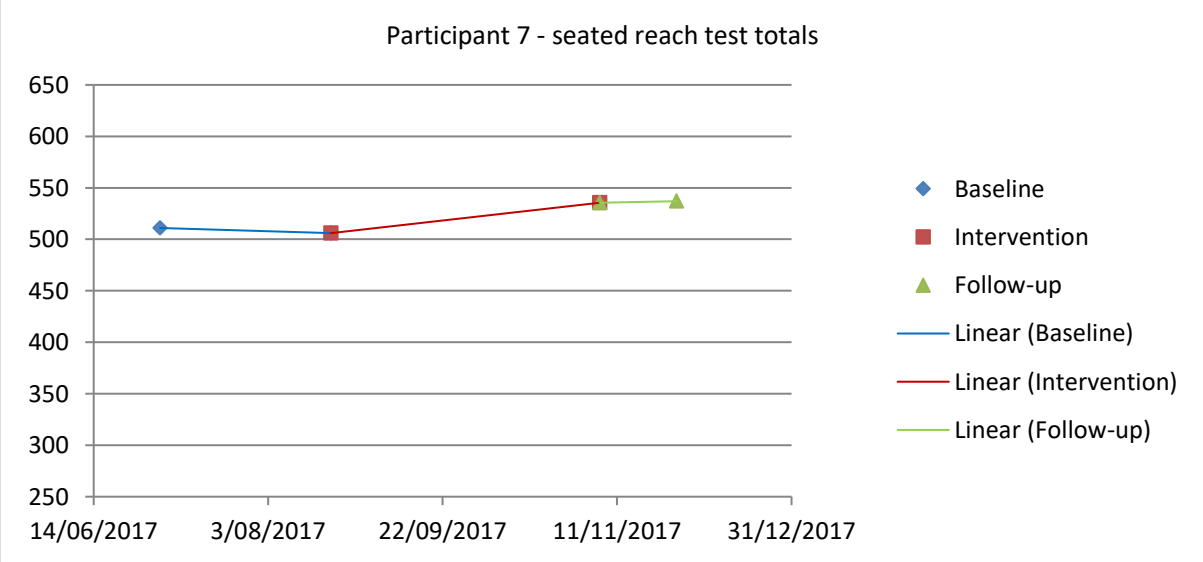


Figure 89. Graph illustrating Participants 7's seated reach test totals

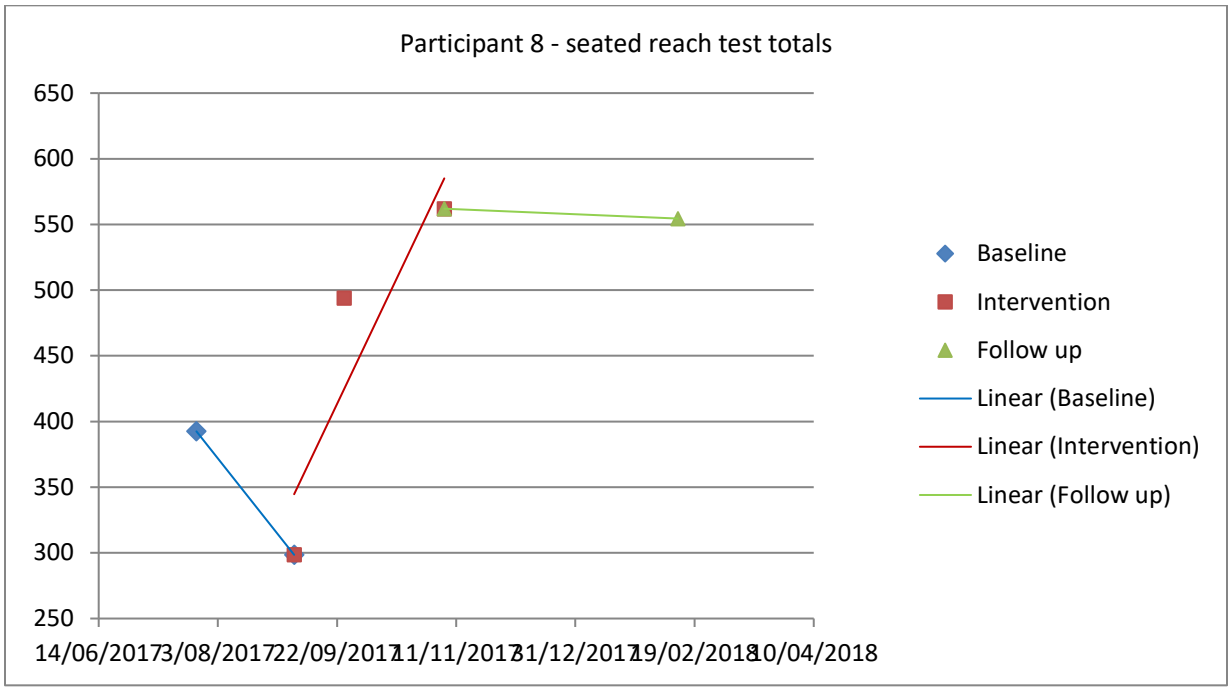


Figure 90. Graph illustrating Participants 8's seated reach test totals

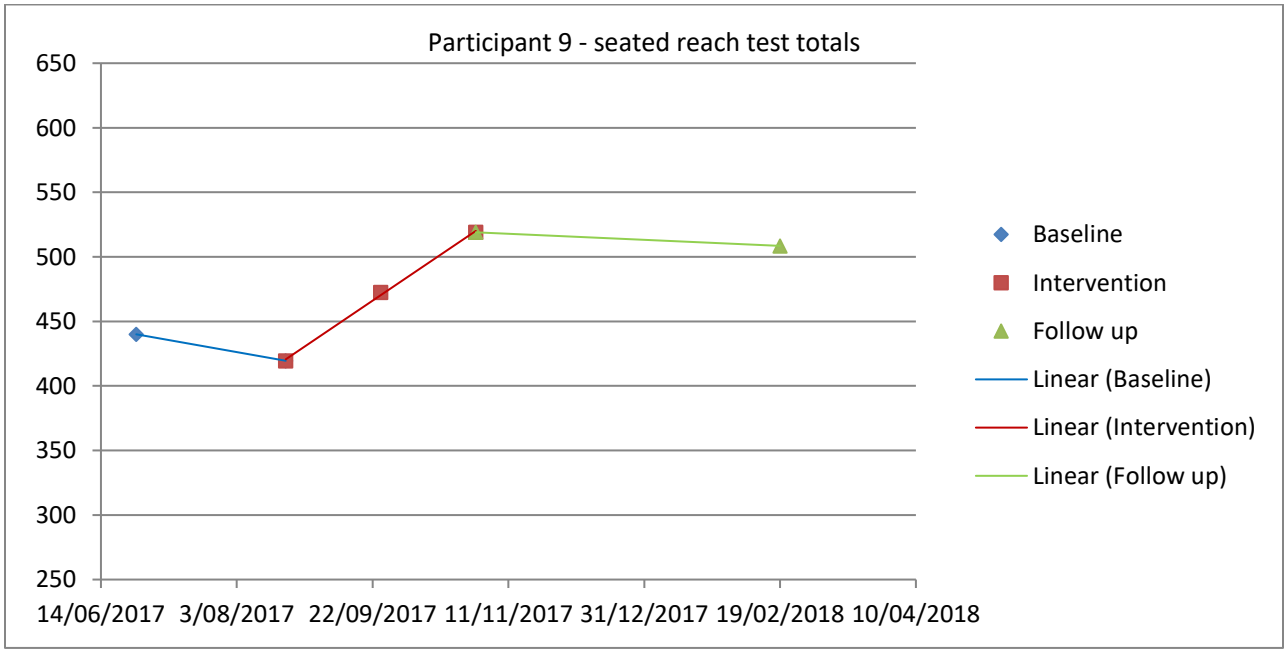


Figure 91. Graph illustrating Participant 9's seated reach test totals

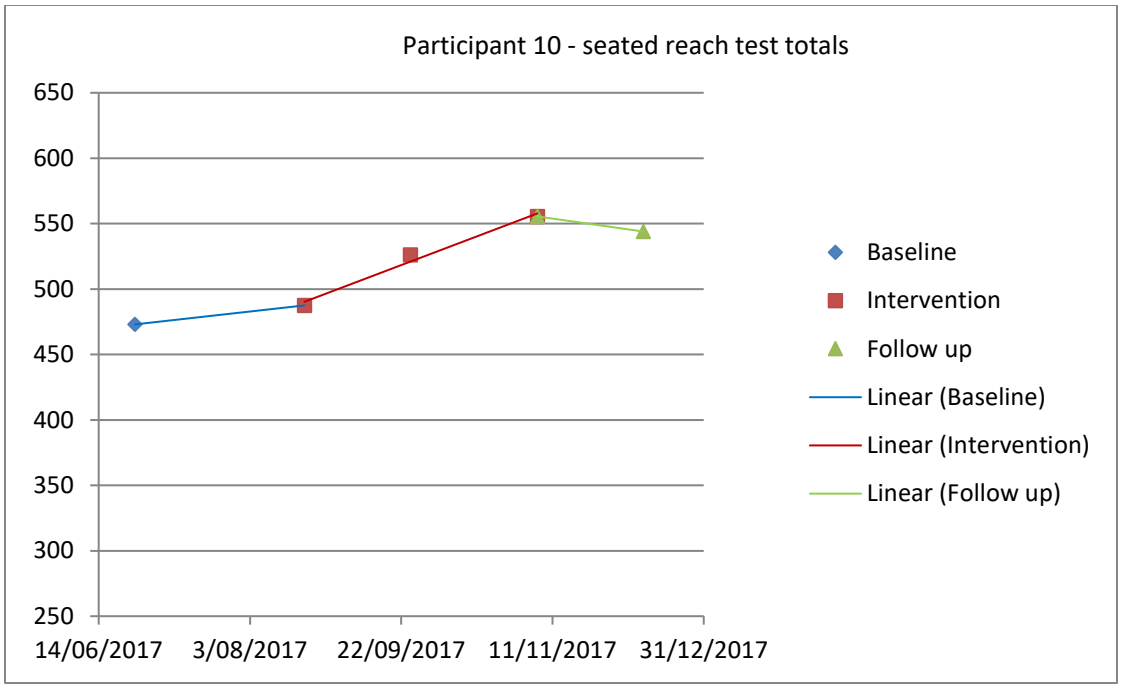


Figure 92. Graph illustrating Participant 10's seated reach test totals

4. Did the participants gain knowledge or skills that they could use beyond the completion of the programme?

All participants reported and demonstrated acquiring new skills or knowledge. Four of the participants found that their thinking about movement had changed and that they had become more aware that different movement options were available to them. ("I learned a heck of a lot from it, and it made me aware and conscious of … this different way of doing things, it kind of opened up a new world", Participant 8, follow-up interview). Participant 6 attributed this to being forced to challenge the way he moved and try different options rather than moving in the same habitual ways. Participant 10 found that "Is there another way" had become part of his thinking (follow-up interview). They were exploring different movement options using the principles they had learnt on the programme. For example, for Participant 7 a concept that really stood out for her was doing less than you can which went against her natural instinct. Participant 8 had learned that moving from her pelvis and torso made movement easier. Participant 10 found

that sometimes when he was performing an action such as walking or turning over in bed he would focus on using the spiral movement he had learnt on the programme as opposed to his habitual way of just throwing his body over.

Whereas Participants 6, 7, 8 and 10 said that the programme had completely changed their thinking about movement, Participant 9 talked more in terms of strategies that he had learned in class that changed this function and symptoms. For example, he found that spiralling had enabled him to get off the floor into his wheelchair and he found that he had learnt to move his legs apart and together as he rolled his pelvis (from the Week 6 lesson) at home to relieve the spasm in his back.

5. What were the participant's overall attitudes to the programme?

Overall the participants' attitude to the programme was positive with participants describing it as "beneficial" (Participant 6), "fantastic" (Participant 7), "really, really, educational and informative…a once in a lifetime opportunity" (Participant 8), "really good" (Participant 9) and "thought-provoking and educational" (Participant 10). Four out of five of the participants spontaneously reported that they enjoyed the programme with two participants mentioning they enjoyed the interaction of the group. All five participants indicated a motivation to continue with the **Feldenkrais Method**.

Without prompting, four out of five of the participants spontaneously and suggested that **Feldenkrais** should be part of SCI rehabilitation

> I think it would be brilliant if it was at Burwood. You know, all those people trying to get to terms with it, it's a mental, a positive mental aspect that you can deal with when you're lying there wondering about how the future's going to be and what can you do and you can't do, to be able to start thinking, I can imagine this and try and get movement going,

like it's a positive side for people…it would be great if they would embrace it out there (Participant 7, follow-up interview).

However participants also acknowledged some downsides of the programme. Participants 6 felt that one barrier for others doing the programme could be the requirement that people could get into their wheelchair from the floor as not many people with SCIs would be capable of that. Participant 7 felt that the room was too small for five people and when everyone was present they were "kind of bumping into each other". She also found that getting real benefit required more commitment than she had anticipated. However she acknowledged that, as this was a course on movement, one would expect to have to practise. Participant 8 felt that I could have done more each week to reinforce what they had learned in previous classes even though it would make the class longer. Participant 10 felt that the range of abilities that I had in the class made it quite challenging to teach and that it would be useful to work with a narrower range of people and to have let individuals know exactly which lessons were relevant to them.

In the Next Chapter

In this chapter I have presented the Phase 3 findings. In the next chapter I will provide a discussion of the whole study.

Chapter 8. Discussion and conclusions

In Chapters 4 to 7 I described the three phases of my study. In this final chapter I will provide a discussion on my whole study.

The aim of my study was to develop an **Awareness Through Movement®-**based **Feldenkrais** programme for people with SCI and identify whether the programme could address some of the negative consequences of SCI. The goals of the programme were as follows:

- Participants have improved postural stability.
- Participants gain skills, knowledge and confidence to explore movement.
- Participants feel motivated to continue learning in this way.
- Participants enjoy the process.

Review of Findings

This study provides preliminary evidence that I have met the programme goals and, for the most part, have achieved my aim. The literature review in Chapter 2 indicates that it makes sense to address some of the issues dealt with by people with SCI using the **Feldenkrais Method**. My work with colleagues and clients in Phase 1 suggests that the approach I intended to use had face validity; it appeared to be effective. My findings in Phase 2 suggested that the programme was feasible, safe and relevant to my participants and the data in Phase 3 provided preliminary evidence that the programme could address some of the negative consequences of SCI as outlined below.

Postural stability.

Participants in Phase 2 reported improvements in balance and Participants in Phase 3 reported and demonstrated sustained changes in postural stability. Improvement in postural stability is consistent with **Feldenkrais** case studies with SCI (Bost, 1997; Ginsburg, 1980;

Wong, 2007) and adds to the growing evidence that the **Feldenkrais Method** is effective in improving balance in both neurological and non-neurological conditions (Batson & Deutsch, 2005; Connors, Galea, et al., 2011; Dean et al., 2008; Hall et al., 1999; Hillier et al., 2010; Seegert and Shapiro (1999) cited in Hillier & Worley, 2015; Hopper et al., 1999; Sobie, 2013; Stephens et al., 1999; Stephens et al., 2001; Ullmann et al., 2010; Vrantsidis et al., 2009).

Ease of movement and function.

Learning to improve efficiency and movement is one of the key goals of the **Feldenkrais Method** so it is not surprising to see that participants reported improvement in ease of movement and function this study. Phase 2 participants repeatedly reported improved ease of movement throughout the programme and Phase 3 participants reported a sustained improvement in ease of movement and function. In addition, the three people that had difficulty with getting on and off the floor at the beginning of the programme were able to achieve this unassisted by the end of the programme. These improvements were consistent with findings in other **Feldenkrais** studies (Batson & Deutsch, 2005; Bearman & Shafarman, 1999; Chinn et al., 1994; Connors, Galea, et al., 2011; Connors, Pile, et al., 2011; Edgar et al., 2016; Hall et al., 1999; Nair et al., 2005; Nambi et al., 2014; Phipps et al., 1997;Ruth & Kegerreis, 1992; Stephens et al., 1999; Webb et al., 2013 Ramli et al., 2013; Schön-Ohlsson et al., 2005; Ullmann et al., 2010; Vrantsidis et al., 2009; Wennemer et al., 2006) where improvements in ease of movement and/or function have been demonstrated in people with multiple sclerosis, pain and osteoarthritis and the able-bodied. They are also supported by anecdotal reports from case studies with SCI (Bost, 1997; Fox, 1978; Ginsburg, 1980, 1986) which have demonstrated improved mobility.

Body awareness and movement strategies.

Participants in both Phases 2 and 3 reported improvements in body awareness and movement strategies. Phase 3 participants found that these changes were sustained. Qualitative improvements in body awareness are consistent with other **Feldenkrais** studies (Dunn & Rogers, 2000; Pugh & Williams, 2014) and further supports Qaiser's (2017) finding that lower limb proprioceptive ability in SCI was improved following sensory training. However, whereas the Qaiser (2017) study and other studies on interventions to improve proprioceptive ability in SCI are confined to walking, the **Feldenkrais** approach applies to a variety of functions, even breathing, and so is applicable to a wide range of people with SCI.

Symptom control.

Although they experienced only transitory symptom reductions, Phase 3 participants reported that they had learned strategies to help control symptoms and four out of five Phase 3 participants showed improvements on the IPQ suggesting that some sense of control had been achieved. However only one participant reported sustained improvements in spasticity and only one participant reported a sustained improvement in pain and fatigue. This is in contrast to other **Feldenkrais** studies which have demonstrated reductions in symptoms in people without SCI (Bearman & Shafarman, 1999; Connors, Pile, et al., 2011; Dean et al., 2008; Lundblad et al., 1999; Lundqvist et al., 2014; Pugh & Williams, 2014; Sobie, 2013; Stephens et al., 2005).

The fact that this programme was not successful in bringing about sustained reductions in pain, spasticity and fatigue is not surprising as it has been established that these symptoms are difficult to manage after an SCI. The participants in my study had long-term injuries (with nine out of 10 participants having had their injuries between 10 and 40 years). As the Phase 2 participants suggested, they had had years of inefficient and painful movement habits to

overcome. They felt that with more frequent ongoing lessons, more sustained changes would be possible.

However participants reported learning strategies to make movement easier. It is possible that the improved ease of movement participants experienced could be a precursor to reduced symptoms. As discussed in Chapter 2, the effort involved in accomplishing everyday tasks is one of the contributors to fatigue in SCI. As the participants in the Löfgren and Norrbrink (2012) study found, learning takes time. They found that learning mental strategies that changed the focus away from the pain took several years to learn but was useful. Learning to move with more ease also takes time but has the potential to provide long-term relief. This differs from drug or exercise solutions which may provide immediate temporary relief but may not lead to sustained improvements in the long-term.

Knowledge and skills.

The increase in knowledge and skill that participants reported in both Phases 2 and 3 was perhaps one of the most important outcomes of the study. If participants understand more about the process of movement learning they can continue learning once the programme is completed. As Moshe Feldenkrais wrote "the more clearly the fundamentals of the process are understood, the greater will be the achievements" (Feldenkrais, 1990, p. 33). This is consistent with the findings of Phipps et al. (1997) who found that their **Feldenkrais** clients were still using the skills they had learned two years later.

However, the fact that the Phase 3 participants felt they could continue to incorporate the method in their life using the homework lessons and the skills that they had learnt in class but the Phase 2 participants felt that they didn't yet have the tools to continue practice without ongoing classes could suggest that the modified home content may have increased the participants'

independence. With such small groups it is hard to come to any conclusion but it is an area for further investigation.

Attitude to the programme.

The fact that participants found the lessons enjoyable and relaxing and indicated a motivation to continue is consistent with the findings of other **Feldenkrais** studies which reported high rates of enjoyment and participation (Hall et al., 1999; Vrantsidis et al., 2009) and reduced stress (Johnson et al., 1999; Kerr et al., 2002; Kolt & McConville, 2000; Netz & Lidor, 2003). Whereas finding the process enjoyable is positive in itself, this could also have an impact on pain as, according to Löfgren and Norrbrink (2012), approaches that people with SCI have found useful in reducing pain include relaxation and interesting, fun and positively demanding activities.

The fact that participant's attitudes to the programme were so positive is also not surprising. Not only did they find it relevant to everyday functioning but it had many of the features that people with SCI have recommended in other studies for managing pain and fatigue (Hammell et al., 2009b; Löfgren & Norrbrink, 2012). These included strategies to manage stress (such as breathing and relaxation techniques), relieve muscle tension, improve postural stability, conserve energy so that activities can be achieved with minimal effort, and maximise their residual potentials; distracting activities, mental strategies that change the focus away from the pain, learning to listen to their own body and respect their own body's limitations (enabling them to find a balance between activity and rest) and physical activity that was designed not to increase pain. They also included working in a group which enabled learning with and from other people with SCI.

Learning from the Process

Going through the PhD process taught me a lot about developing and evaluating a programme. Some of my learning as discussed below.

Phase 1.

Consulting with so many people (both practitioners and clients) in Phase 1 was a valuable process. Dr Goldfarb provided encouragement and helped me to organise my lessons in a way that was easy for me to follow. He also asked me important questions such as "what ways do you offer the participants to be able to test their progress?" and "Most of your lesson structures emphasise differentiation; you rely minimally on configurational constraints. What is your reasoning for this choice?" These questions encouraged me to improve my ATMs (for example incorporating test and reference movements) and to articulate the reasoning for some of my decisions. One of the most negative criticisms I received from Dr Goldfarb was in regard to the original homework that I had devised. I wanted to tell my participants how scientific and effective the method was and so poured a large amount of detail such as research and testimonials into the homework. I spent hours collecting images to support what I had written. It became very complex. Dr Goldfarb encouraged me to throw it out and start again. I realised then that what was most important was that the clients find ways of experiencing the method. If they wanted to do more research in their own time they could do so. My revised homework was much simpler.

Teaching the ATMs and the full programme several times in Phase 1 was useful both in that it provided me with opportunities to practise teaching the material and it helped me identify what needed changing. For example, teaching to Group 1 enabled me to modify my teaching strategies. It helped me to ascertain what movements needed to be modified and how to pace the

lessons. Sometimes I also gained ideas from watching how participants dealt with the instructions I gave them. For example, when working with Group 1 in Lesson 2, I had the participants move their pelvis and shoulder together and apart from side lying. One of the participants achieved this by placing her hand on the rim of her pelvis and straightening her arm, thus moving the pelvis and shoulder together and apart. I then incorporated her strategy as part of the lesson for the next phase.

When I taught the programme to Group 3 (the **Feldenkrais** practitioners) in Phase 1 I found that they were good at fine-tuning my lessons and picking up oversights. For example, one practitioner noticed that I started every side lying lesson from the left side and recommended that I vary this. Another gave me guidelines on how to improve one of my body scans. As part of the body scan they visualised each vertebra of the spine which is fairly challenging. The practitioner suggested that I gave them cues along the way about the position of the vertebrae. For example T12 attaches to the last rib. One practitioner suggested that, where possible, I get the participants to touch themselves in the area being demonstrated during the skeleton demonstration. For example, they could feel for themselves the position of the upper rim of the pelvis. Teaching Group 3 also had its challenges. I couldn't decide whether to present to them as they were (a group of **Feldenkrais** practitioners) or role-play as if they were a group of people with SCI; I alternated between the two positions. At times it felt inappropriate to be teaching them what they already knew and lessons that were successful for Group 1 seemed to be slightly boring for Group 3.

Phase 2.

Running the programme in Phase 2 increased my confidence in my ability to develop and teach a programme for people with SCI. I was surprised how smoothly it went. I got exactly the

number of participants I wanted, I managed to find a time that worked for everyone, everyone involved was reliable, the participants were a great and varied group to work and there were no hitches throughout the process. My supervisors put this down to careful planning. This was in stark contrast to what was happening outside of my PhD - the earthquakes and the downstream effects, my head injury and constant management of my fibromyalgia.

However I had difficulty attending to all participants all the time. I think that having more than one practitioner would have worked better for a group this size; that whereas I could run a group with less than three people single-handedly, I needed assistance with more than three. However I was working as a practitioner researcher, the only **Feldenkrais** practitioner in Christchurch with significant experience with SCI, the only person really familiar with the programme and my original vision was to develop a programme that could be run single-handedly by one practitioner.

In reviewing the video data I was limited in what I was able to retrieve from the videos. When watching the videos, I was unable to see everyone all the time so relied on what I could hear. This was often difficult as people spoke over each other and I could not always see what people were doing as sometimes they were not in the line of the camera or were blocked by another participant.

I had assumed that most of my time would have been spent modifying the lessons to meet the needs of the participants and that the benefits from the lessons would have been minimal. I was surprised therefore how much participants were commenting on the benefits that they were getting. However, on the basis of my observations and feedback from the participants, I decided I needed to make some changes to the research process and the programme. A challenge when deciding what changes to make was determining which of the participants' comments needed

addressing and which not. If only one participant mentions an issue, how important is it to address that issue? According to Dick (1993), in order to be responsive, action research sacrifices generalisation for local relevance. The need of a particular participant may be unique to them and may not represent the needs of people with SCI. For example, whereas Participant 4 and Participant 5 enjoyed the sitting lessons, Participant 1 found that they gave her nausea. Whereas Participant 2 did all the homework CDs, some participants did none.

Phase 3.

Whilst, at the time, suspending my PhD in Phase 3 was a nuisance for me, doing so meant that, by 2017, I had learned from some of my mistakes in 2016. When I first recruited my participants in 2016, it seemed that four people met the criteria. However, at the preliminary interview, I found out that two of the final participants did not actually have an SCI. They had spinal injuries with no damage to the spinal cord. This was despite the fact that I had specified in the advertising material and the information sheet that I was looking for people with SCI. Given this, when recruiting in 2017 I double checked with the participants that the damage was actually to the spinal cord.

I realised that it could have been less stressful for me if I had set a programme time that worked for me and given participants a deadline for committing to an interview time. In 2017, when five participants had confirmed that they would attend, we had agreed on a time and four of the participants had attended the preliminary interviews, one of the committed participants was slow at getting back to me. I emailed and texted him, asking him to get back to me as soon as possible. When he did get back to me, it was a few days before baseline testing of the perceived exertion and function tests was due to begin so I was under pressure to find another participant that could attend at the time on which we had agreed. To add to this, in coordinating a

time, I had arranged for us to meet at a time that wasn't optimal for me and some of the participants. The time however was optimal for the participant that pulled out. Fortunately, a participant on the waiting list was willing to attend an interview at short notice and commit to the time that we had arranged. I realised that if I had set a deadline for committing to an interview time, I would have more quickly approached the participant on the waiting list.

The false start in 2016 provided me with a serendipitous pilot. In my initial plan, I had intended to do a pilot test of my measures. Because of the distractions of the year, I did not get round to this and only pilot tested with a supervisor and went quickly through the online tests with another student. As my two participants from 2016 had completed the tests in the first three weeks of baseline, I was able to review how they had answered the questions and make modifications. For example, in 2016 I used a 5-point Likert scale as was on the original IPQ. However I noticed that one of the participants in 2016 had, at baseline, strongly agreed with the first two items - that there was a lot that he could do to control the symptoms and that what he did could determine whether he got better or worse. There was no scope for improvement on these items so I increased this to a 7-point scale to increase its sensitivity.

In 2016, I found that it appeared that many of the movements in the perceived exertion tests were very easy. There was very little scope for improvement. This was for a number of reasons - a typo in my description of one the movements, my failing to describe to them what I expected of them and some movements just being too easy. Given this, I had the opportunity to modify the tests to make them more difficult and to describe to participants exactly what was expected of them.

In 2016, I found that participants' interpretation of my instructions for the seated reach distance tests varied. Initially I had just required that they push the solder across the table as far

as they could to the right comfortably. I found that one participant pushed the solder from the bottom and another pushed the solder with the fingers on top and one participant leaned on the table as he pushed the solder so he was in effect using the table to balance himself. They both strained to push the solder as far as they possibly could; this meant they could not return to sitting without using their arms. Given that I wanted to ensure they used the same strategy every time and that the programme was about learning to use the trunk to balance and not rely on the arms or table, I refined the instructions. The modified instructions stated that the solder must be placed between the thumb and forefinger, they were required not to lean on the table and they were required to only reach as far as they could go without having to use their arms to return them to sitting.

I also encountered a few difficulties around data collection. Despite my emailing the day before and texting on the day, participants frequently forgot to fill out the baseline questionnaires. Sometimes the logistics of life made it difficult to fill out the questionnaire at the same time each day. For example, they were out-of-town or had no Internet access. Eventually most of the participants completed the questionnaires without prompting.

Initially there were teething problems around completion of the symptom questionnaires. Participant 8 wanted to select more than one pain location on the pain questionnaire and found that she was unable to. Participant 7 (who hadn't realised it was going to be a pain questionnaire) had filled out the spasticity questionnaire as if it were the pain questionnaire. These issues were easily ironed out.

A positive for me was doing the individual analysis. It was difficult during the programme to pay attention to what was going on for the individuals, particularly in Week 5 when the whole group was present. I found that in doing the qualitative data analysis I was able

to pay more attention to each individual's process. This had not been so easy when I was trying to attend to all participants. For example, it wasn't till I viewed the videos that I was able to see that Participant 9 was becoming more independent at getting into his wheelchair. Comparing Participant 10's body awareness tests enabled me to see more clearly how much his strategy had changed.

One of the differences between the reported outcomes in Phase 2 and Phase 3 was the fact that changes were sustained at Phase 3 and not Phase 2. This may be attributable to the changes I made to the programme in response to participant feedback (i.e., the new structure, the more flexible homework), the fact that I had had more practice at teaching the programme or differences between the participants in the two studies. However, given that this is such a small study, any conclusions require further investigation.

Strengths of the Study

To the best of my knowledge this is the first systematic study of the use of **Feldenkrais** with SCI. Previous studies of **Feldenkrais** and SCI are case studies with no systematic evaluation or measurement. Previous studies of **Feldenkrais** and SCI also use FI not ATM whereas ATM provides many advantages such as group support and promotion of independence.

This programme goes some way to overcoming the barriers of accessibility, costs, and a lack of knowledgeable health professionals identified by Newitt et al. (2016). Given this, replication of the programme in other centres is feasible. As it is a group programme that does not involve the use of complicated, expensive equipment, it has the potential to be less costly to run than some interventions such as personal gym training. Participants are encouraged to be independent and continue to apply what they have learned once the programme is completed.

They are provided with tools with which to practise so they do not require frequent visits to practitioner. Thus it is an effective way to improve issues such as postural control without the requirement of extensive input from a rehabilitation facility or intensive repetition from participants as suggested by Harvey et al. (2011) (Chapter 2, page 31).

Participants did not report any negative side effects from the programme and were surprised to see how much they could improve their functioning without pain or effort. As participants worked in sitting or lying and were encouraged to work at their own pace (even just visualising the movements) and not to strain or push through pain, it overcame many of the barriers to participation in physical activity (such as lack of walking stability, muscle weakness, pain, spasticity, stiffness, fear of injuring themselves, fatigue) identified by Newitt et al. (2016) and Crane et al. (2017) (Chapter 2, page 37).

Another strength of the study was the methods used. Action research provided an effective way to develop a programme of this nature. Prior to doing my PhD, I had learnt a lot about the application of **Feldenkrais** to people with SCI. I wanted to begin documenting some of my learning in a formal way and develop a programme or structure so that my work could become of value to people with SCI and those working with them. I realised that action research was the ideal method to use. It matched my pragmatic philosophy and encourages us to explore new avenues. Using single case research studies was also ideal with a group of this nature where the prevalence of the condition is low. It enabled me to analyse data both at the individual and group level and to investigate the programme without recruiting large numbers of participants.

Limitations of the Study

There were a number of limitations to this study. These included the size and requirements of the group, the volume of outcome measures used, the tests and tools used and how the quantitative tests were carried out.

Group size and requirements.

The size of the sample group makes it difficult to draw strong conclusions from the research. However, the group needed to be small, in part, because of limitations in budget, there was a limited number of participants that met the criteria and it would have been difficult for me to attend to more than five participants at a time. To draw conclusions in future about the effectiveness of the programme, it would be useful to have larger or more groups. This could be possible if there were more **Feldenkrais** practitioner involved in running the programme. Programmes could be run in other centres and with larger groups with additional **Feldenkrais** practitioners assisting in the running of the programme.

The nature of the target group requirements (i.e., the fact that they needed to get the able to on and off the floor) is also a significant limitation. Getting on and off the floor was difficult for some of the participants. In future, with additional funding and more space, it would also be useful to build plinths on which people could do ATMs. In addition some of the ATMs could be modified further to be performed in a chair or on a plinth or bed.

Although the target audience was confined to people that could get on and off the floor, there was a wide range of ability within the groups. One of the participants felt that it would have been useful to work with a narrower range of participants; more clearly targeting the group requirements and letting individuals know exactly which lessons would be relevant to them. Other participants also felt that they needed more individual attention. A variety of needs is likely

to be a problem when performing ATM. FI is more appropriate for meeting individual requirements. However, having more **Feldenkrais** practitioners assisting with the running of the programme in future would enable participants to receive more individual attention.

Outcome measures.

In this study I had too many outcome measures. This created a burden for the participants and meant that I was unable to give each of the outcome measures more detailed testing and create more reliability checks. It would have been more useful to have been guided by and limited to the outcomes reported in Phase 2. When I first began my Ph.D., I was more interested in exploring the effect of the **Feldenkrais Method** on body awareness and ease and range of movement and function in SCI. I thought that this would be an appropriate topic for my Ph.D. and assumed after working with a number of people with SCI, that these would be desirable and relevant outcomes. However after an initial review of the literature I learned that it appeared that there were more pressing issues such as pain, spasticity and fatigue. Issues such as body awareness, ease of movement and addressing function did not seem to be high on the list of consumer research priorities. Focusing on function went counter to the social model of disability which draws attention away from the functional limitations of individuals onto disability caused by disabling environments, barriers and culture. With this in mind I decided to explore the effect of the method on pain, spasticity and fatigue. However, improvements in body awareness, ease and range of movement and function, balance and control seemed to be the most significant outcomes to the Phase 2 participants so I added these to my outcome measures. In doing so I created a large number of outcome measures.

In his guide to action research theses, Dick (1993) suggests doing a scan of the most important literature in the field but suggests that reading the content literature can be wasted if

the research takes off in a different direction. In my case, I let the content literature influence my direction to the point where it almost overrode my observations from working in the field. In choosing to address pain, spasticity and fatigue I was very much influenced by the literature. If researchers are solely guided by the existing literature and the funders' preferences and do not follow their own observations, then we risk not making new discoveries or seeing the field through fresh eyes.

Observing how much my participants appreciated learning easier ways to function highlighted for me that sometimes it's not what you're teaching that's important, but how you teach it. If the lessons do not cause pain, are pleasurable and the focus is on making function easier without implying a judgement of participant's current level functioning, participants are more likely to enjoy the intervention. In addition, the fact that the existing research does not indicate that improving body awareness is a priority, does not mean that body awareness should be overlooked. In fact, focusing on body awareness could lead to significant changes for people with SCI.

Tests and tools.

Limitations on funding meant I was limited in the tools available to me .The quality of the video at times limited the quality of the qualitative data I was able to collect. I was unable to find any affordable tools to measure changes in body awareness or complex biomechanical changes and I relied on the physical education students and participants to be my independent observers. In addition, the fact that I had used a modified seated reach test made it difficult to compare the results to other studies. However with increased funding it would be possible to use more sophisticated tests to determine what changes have taken place and to include an independent assessor in the measurement of the reach test.

Another limitation was the choice of movements and functions used for the perceived exertion tests some of which were inappropriate for some participants. For example, Participant 10 found the weekly perceived exertion in movement questionnaires too easy for him. In future it would be useful to use the Patient Specific Functional Scale (PSFS) (Connors. Pile et al., 2011) which evaluates how participants are performing on activities that they have selected as being important to them in everyday lives. This would enable participants to choose functions that are appropriate to them.

In addition, as Participant 6 pointed out, there may have been changes in perception as participants progressed through the programme thus influencing how they rated their perceived exertion. He felt that as movement became easier, he was tougher in how he rated it. Often when people first come to the method, it takes them a while to adjust to making observations about their movement. From my experience, the more I practise **Feldenkrais**, the more aware I become of how much effort I'm putting into movement. So although movement has become easier, my awareness of the effort has increased.

With a short baseline, limited data points, and the variability of symptoms it was hard, if not impossible, to achieve a stable baseline for the symptom tests. In addition the fact that this was a single case research study meant that participants had to repeatedly perform measures to determine whether or not change had taken place. The downside of this is that it is not clear whether improvements are due to the programme or due to participants practising the movements during the tests. With more longitudinal studies it would be easier to establish a stable baseline and with more participants it would be possible to run RCTs which would mean that repetitive practice saying of the test would be avoided.

Another weakness was my failure to thoroughly pilot test the measures prior to carrying out the programme. If I had done so I would have identified the error in the spasticity test described on page 275.

A major difficulty is that there currently appears to be no really effective way to measure the learning and embodiment of movement principles. The focus of the **Feldenkrais Method** is on learning; it is not about reducing pain or increasing seated reach distance but learning about oneself and how one moves. Just because one does not get a decrease in pain, this does not mean they have not learnt anything. Just because a participant knows a movement principle, this does not imply that they can embody or apply that principle in everyday life. Sometimes it can be a matter of time before one is able to apply that principle in such a way that it improves their quality of life. However, difficulties in measuring learning are not unique to the **Feldenkrais Method** but are common to any intervention aimed at learning and the qualitative feedback from the participants indicated that learning took place.

Teacher characteristics.

One factor that could influence the generalisability of the results is teacher characteristics. Throughout both Phases 2 and 3, participants commented on qualities that I brought to the programme; in particular my own experience of disability, my passion for the method and my patience with their individual differences and difficulties. However, I believe that these characteristics are common in **Feldenkrais** practitioners. I have found that many practitioners come to the method because of their own experience of pain or disability; practitioners are still passionate about the method decades after their training and being client-centred is core to the method.

Implications for Rehabilitation with SCI

This study has implications for rehabilitation with SCI. The **Feldenkrais Method** offers a client centred, process-oriented approach that focuses on expanding the clients' internal awareness and self-knowledge. Some people with SCI (such as Molly Hale and Kevin Hitchcock who I introduced in Chapter 1), using strategies which are part of the **Feldenkrais** approach, have achieved more than was possible with mainstream approaches alone. Research by Lundblad et al. (1999) and Malmgren-Olsson and Bränholm (2002) has also provided empirical evidence of **Feldenkrais** performing better than physiotherapy in the management of pain. Participants of this study reported finding it enjoyable and relevant to their everyday lives. By developing an understanding of the **Feldenkrais** approach and experiencing ATM and FI, traditional SCI rehabilitation providers could learn strategies to enhance their practice. Although there are many benefits that people with SCI are gaining from traditional rehabilitation, it is clear that there are a number of areas in which traditional rehabilitation is inappropriate or lacking. This is evident from the feedback I received from participants in my study. For example, participants in Phase 2 described the frustration and pain they experienced from the physiotherapy approach (see page 130) and participants from both Phases 2 and 3 expressed the belief that **Feldenkrais** should be part of rehabilitation. It is also evident from the literature review. For example, as shown in the Löfgren and Norrbrink (2012) study participants requested complementary approaches to managing pain (page 35) and some were finding that exercise was making the pain worse (page 39). In the Hammell et al. (2009b) study participants recommended that a fatigue management programme should include activities such as yoga, breathing and relaxation techniques and strategies to conserve energy and they emphasised the benefits of working in a group with other people with SCI (page 39).

Another features that may be lacking in traditional rehabilitation is the enhancement of body awareness. Reports from people with SCI suggest that increasing body awareness has not really been addressed in traditional rehabilitation. Participants valued paying attention to the neglected parts of their bodies particularly as traditionally they have not been encouraged to. Appreciation of this approach is evident from comments such as that made by a Phase 2 participant, diagnosed with a complete tetraplegia "I've been in a chair 22 years now and have never ever thought about using those or even knew that they were there that sort of mobility in your ribs and spine and things like that…so I'm definitely feeling some benefits".

Another strategy commonly used by the **Feldenkrais Method** is MI. Although a handful of studies have demonstrated that MI improves motor function after an SCI, there is still limited work done in this area.

Although strategies such as the use of motor imagery may become more mainstream, there are some unique features that distinguish the **Feldenkrais** method from other approaches. An important feature of the **Feldenkrais Method** is its focus on learning how to learn. The **Feldenkrais Method** encourages exploratory learning with intrinsic feedback, thus empowering the client to discover for themselves easier ways of moving. Just because we can execute an action, does not mean that we know how we are doing it. By understanding how we perform an action, we can improve the performance of not only that action but many other actions. Movement is complex so generalised learning is important. Knowing how to explore one's movement enables one to generalise that learning to other functions. This means that the client is not just limited to performing the functions that the therapist has taught them but has the tools to improve the myriad of functions we perform every day.

Participants found the lessons relevant to their lives and were motivated to continue with the **Feldenkrais Method** at the completion of the programme. Participants are more likely to be intrinsically motivated when they see an intervention making a difference to the lives. This is in contrast to approaches where extrinsic goals are set. Having increased strength according to the measurements rendered from a dynamometer (an instrument used in rehabilitation to measure strength) or increased reached according to the seated reach test are only meaningful if participants see an improvement in their daily life.

A number of other strategies help to enhance learning. For example variability of practice, used extensively in **Feldenkrais** lessons, provides plenty of opportunities to learn and also keeps lessons interesting. Learning is also facilitated in part by reducing effort and focusing on increasing ease and stimulation of the parasympathetic nervous system which is in contrast to the traditional "no pain, no gain" philosophy. The client benefits not only from improved function but also from finding ways to reduce stress, important when dealing with an event as dramatic as an SCI. **Feldenkrais** practitioners also learn how to break movement up into manageable chunks so that clients can continually succeed.

Traditional ways of dealing with spasticity could also be modified. Rather than using spasticity (which is fatiguing and unsustainable) to perform some functions, the **Feldenkrais Method** explores ways of achieving functions without resorting to spasticity. For example, the traditional practice of initiating a roll with spasm may not be necessary. The **Feldenkrais** approach of slowing down the movement and exploring ways of moving without spasm may lead to more sustainable movements in the long-term. Stretching to lengthen muscles may also not be the most effective way to deal with spasticity and contractures, particularly given the fact that Cochrane Library systematic review reported that stretching had little or no effect on pain,

spasticity, activity limitation, participation restriction or quality of life and could possibly lead to pain, and skin redness or breakdown (Katalinic et al., 2010). Strategies such as slowly learning how to differentiate joints may render more benefits in the long-term.

Another implication from this study is the importance of challenging assumptions and being open to possibilities, despite diagnosis. The experiences of participants on this programme challenged their preconceptions, e.g., the limitations of their diagnosis, what could be achieved without forcing and stretching, and the effectiveness of visualisation. Sometimes it appears that people have been limited by what they have been taught is possible. And possibly those limitations come from the limitations of the rehabilitation methods available.

The findings of this study also have implications for **Feldenkrais** practitioners undertaking rehabilitation with SCI and other neurological conditions. The programme developed could provide a framework for further programmes that cater to all levels of SCI and other disabilities and could be used as an introduction to programmes on more complex functions, e.g., programmes on the connection between trunk and limb function or programmes on bowel and bladder function. **Feldenkrais** practitioners could also benefit from some of the observations I have made during this study, for example the strategies I used to deal with spasticity when doing ATMs.

Future Research and Development

This study was a pilot study with a small group and a relatively short intervention. However promising findings from the data in Phase 3 suggest that further empirical testing is warranted. This approach could form the beginnings of a model for multicentre research projects evaluating the impact of **Feldenkrais** on SCI. With increased funding it should be possible to do

longer interventions, explore longer term outcomes and could include the use of multiple practitioners in each group session, thus enabling more participants in each group. With larger numbers of participants it could also be possible to conduct RCTs using this programme. A longitudinal study with a longer intervention could potentially produce sustained changes.

Outcome measures for short-term studies (12 weeks) could include a seated reach test, the ratings of perceived exertion, and the PSFS (Connors. Pile et al., 2011). Outcome measures for longer-term studies could include the pain, spasticity, and fatigue scales used in this study. Comparisons could be made between the cost effectiveness of the **Feldenkrais** approach and other modalities funded by ACC.

The body awareness test I used was one I developed myself and has not been validated. Another possibility for future research is to explore the validity of this test and identify whether it could be used in other studies on the **Feldenkrais Method** and/or body awareness.

Until funding is available, the programme could be used by other practitioners working with wheelchair users. Outcome measures such as the PSFS and the reach tests could be used to monitor changes. In addition, practitioners could use videos to enable them to more closely monitor participant feedback and changes.

An action research process could also be used to develop this programme further. Although it appeared that the Phase 3 programme was an improvement on the Phase 2 programme, there was still a lot of scope for improvement based on the feedback from participants. For example it was clear that at least one of the Phase 3 participants felt that I could have done more to reinforce what they had learnt in previous classes. Further feedback from participants could also enable practitioners to modify and refine the homework and overcome some of the difficulties that participants had in completing it. This could enable participants to

practice more at home and thus, to some extent, overcome some of the barriers to participation such as injuries, illness and transport difficulties.

For those that are not able to meet the requirements of the programme, future programmes could be developed using the same structure but with modifications to the ATMs so that they could all be performed from chairs or be practised as home programmes from beds. Future programmes could also be developed for other groups of wheelchair users using the same model.

Conclusion

There is sufficient evidence that the programme has a defensible theoretical rationale and that it is feasible, safe and relevant for people with SCI. There is also preliminary evidence that it addresses some of the negative consequences of SCI, namely loss of postural stability, ease of movement and function, and loss of body awareness and that it provides participants with knowledge and skills to explore movement and manage their condition. Replicating this study in other centres could enable stronger conclusions to be drawn.

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Appendix 1.1. University of Canterbury Human Ethics Committee Approval

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2011/113

1 December 2011

Lucinda Allison
Health Sciences Centre
UNIVERSITY OF CANTERBURY

Dear Lucinda

The Human Ethics Committee advises that your research proposal "The impact of a Feldenkrais® Postural Control Programme on pain, spasticity and fatigue in spinal cord injury: a mixed methods study" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 29 November 2011.

Best wishes for your project.

Yours sincerely

Michael Grimshaw
Chair
University of Canterbury Human Ethics Committee

Appendix 1.2. . Upper South Health and Disability Ethics Committee Approval

Health and Disability Ethics Committees

Upper South A Regional Ethics Committee
c/- Ministry of Health
Montgomery Watson Building
6 Hazeldean Road
Christchurch
Phone: (03) 974 2304
Email: uppersoutha_ethicscommittee@moh.govt.nz

31 October 2011

Ms Lucinda Allison
6/118 Office Road
Merivale
Christchurch 8014

Dear Ms Allison

Ethics ref:	**URA/11/10/057 (please quote in all correspondence)**
Study title:	**The impact of a Feldenkrais Postural Control Programme on pain, spasticity and fatigue in spinal cord injury: A mixed methods study**
Investigators:	**Ms L Allison, A/Prof Ray Kirk**

This study was given ethical approval by the Upper South A Regional Ethics Committee. A list of members of the Committee is attached.

In the information sheets, please refer to the committee as the Upper South A Regional Ethics Committee.

Approved Documents

- Information sheet and consent form for Development stage version 2 dated 26/10/11
- Information sheet and consent form for Evaluation stage, version 2 dated 26/10/11
- Advertisements version 2 dated 26/10/11
- Letter to Health Professionals for Development stage, version 2 dated 26/10/11
- Letter to Health professionals for evaluation stage, version 2 dated 26/10/11
- Postural Stability test version 2 dated 26/10/11
- Questionnaires, version 2 dated 26/10/11
- Interview guidelines version 1 dated 22/09/11

This approval is valid until 1/12/2017, provided that Annual Progress Reports are submitted (see below).

Amendments and Protocol Deviations

All significant amendments to this proposal must receive prior approval from the Committee. Significant amendments include (but are not limited to) changes to:

- the researcher responsible for the conduct of the study at a study site
- the addition of an extra study site
- the design or duration of the study
- the method of recruitment
- information sheets and informed consent procedures.

Significant deviations from the approved protocol must be reported to the Committee as soon as possible.

Health and Disability Ethics Committees

Upper South A Regional Ethics Committee
c/- Ministry of Health
Montgomery Watson Building
6 Hazeldean Road
Christchurch
Phone: (03) 974 2304
Email: uppersoutha_ethicscommittee@moh.govt.nz

Annual Progress Reports and Final Reports

The first Annual Progress Report for this study is due to the Committee by 31 October 2012. The Annual Report Form that should be used is available at www.ethicscommittees.health.govt.nz. Please note that if you do not provide a progress report by this date, ethical approval may be withdrawn.

A Final Report is also required at the conclusion of the study. The Final Report Form is also available at www.ethicscommittees.health.govt.nz.

Statement of compliance

The committee is constituted in accordance with its Terms of Reference. It complies with the *Operational Standard for Ethics Committees* and the principles of international good clinical practice.

The committee is approved by the Health Research Council's Ethics Committee for the purposes of section 25(1)(c) of the Health Research Council Act 1990.

We wish you all the best with your study.

Yours sincerely

Alieke Dierckx
Administrator
Upper South A Regional Ethics Committee
Uppersoutha_ethicscommittee@moh.govt.nz

Health and Disability Ethics Committees

Upper South A Regional Ethics Committee
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List of members of the Upper Region A Ethics Committee, October 2011

Liz Richards (Chair)	Consumer Representative Lay member	Female
Angelika Frank-Alexander	Community Representative Lay member	Female
Allison Franklin	Consumer representative Lay member	Female
Jane Kerr	Researcher Health Professional Member	Female
Ellen McCrae	Pharmacist Health Professional member	Female
Edie Moke	Maori representative Lay member	Female
Barbara Nicholas	Ethicist Lay member	Female
Christine Robertson	Health Practitioner Health Professional member	Female
Martin Than	Researcher Health Professional Member	Male
Jinny Willis	Health Practitioner Health Professional member	Female

Angelika Frank-Alexander, Ellen McCrae and Jinny Willis were not present at the meeting of 17 October 2011.

Alieke Dierckx (Administrator)

31 October 2011
Date

Appendix 4.1 Programme Overview

The table below provides an overview of the programme.

Wk	**Lessons**	**Attribute of optimal movement & SPIFFER[7]**	**ATM**	**Skeletal Focus**	**Body scans**	**Homework**
1	Foreground versus background, the role of the torso in function		ATM 1: Floor - rolling forward and back on right side	Oval shape of torso	General body image with focus on torso	**Alan Questel**, Uncommon Sensing, Disk 1, Track 2: ATM 1: *Shoulderness* **Cliff Smyth**, Easy Hands and Arms, Volume 1, Lesson 3. *Moving from shoulders and hips*.
2	Making sensory distinctions	Effort	ATM 2: Floor - lateral flexion	Ribs and how they open on one side, close on the other	Finding comfort, circling on ribs	**Alan Questel**, Uncommon Sensing, Disk 4, Track 3: ATM 5: *Pressing and Lifting Your Ribs* **Alan Questel**, The Moment Where We Begin, Disk 4, ATM 6, *Xposition: Pressing/Lifting* **Alan Questel**, Pregnant Pauses, Disk 2: *Pressing and Lifting*
3	The influence of breath on movement, the power of	Breathing RESPIRATION	ATM 3: Floor - flexion	Ribs, diaphragm	Breathing, abdominals	**Deborah Bowes,** Pelvic Health and Awareness for

[7] Developed by Larry Goldfarb, SPIFFER categories are aspects of movement that we can pay attention to in order to increase awareness of how we move.

	the imagination;					Women and Men, Disk 1, Track 7, Lesson 1 *Breathing to Relax and Balance the Nervous System* Track 8, Lesson 2 *Activating the Right and Left of the Pelvic Floor.* Disk 2, Lesson 1 *Engaging the Abdominals*
4	Moveability, process versus goal oriented learning	Moveability	ATM 4: Floor - rolling from back to left side (rolling into flexion) and back	Pelvis	Pelvis	**Alan Questel**, Pregnant Pauses Disk 1: *Easy Rolling* **Alan Questel**, Growing Young, Disk 1, Track 2: *Easy Rolling.*
5	Pain and fatigue; distribution of work	Distribution SEQUENCE	ATM 5: Floor - rotation	Relationship between shoulder and hips	Hip joints, sensing diagonals	**Deborah Bowes**, Discover Easy Movement and Pain Relief, Lesson 6: *Gentle coordination of your shoulders and hips* **Mark Reese and David Zemach-Bersin,** Relaxercise, Disk 1, track 2: *Learning Easy Flexibility*
6	Voluntary movement vs spasticity	Smooth flow FLOW	ATM 6: Floor - arm circles	Shoulder girdle, ribs and how the	Orientation of	**Arlyn Zones**, A Flexible Chest, Disk 2, track 2:

				ribs support the shoulder girdle, arms. Radius and ulna and how they rotate.	shoulders and arms, propensity to spasm	*Circles of the Arm*
7	Organising yourself over your sitting bones	Dynamic foundation FOUNDATION	ATM 7: Chair-reaching left	Sitting bones, tilting of pelvis, feet	Sitting bones and weight through sitting bones, feet	**Mark Reese and David Zemach-Bersin,** Relaxercise, Disk 4, track 1: *Aligning the Body*
8	Coordinating the torso with the head and limbs	Co-ordinated action	ATM 8: Floor - extension	Spine and changing size of body of vertebrae	Vertebrae	**Alan Questel**, Uncommon Sensing, Disk 5, Track 1: *Looking and Lifting…For a Surprise*
9	Parasitic movements, efficient movement	Congruence PATH	ATM 9: Floor - rolling from left side to front (rolling into extension) and back	Hip joints, legs, knees,	Hip joints, legs skeleton and its connections	**Deborah Bowes and Cliff Smyth,** The Primary Image, Disk 1, Lesson 2, *Five directions*
10	Nerve entrapment; path of least resistance	Transmission	ATM 10: Floor - extension/flexion	Relationship between shoulders, ribs, spine and pelvis inflexion and extension – opening and closing	Are you arched forward or back?	**Alan Questel**, Growing Young, Disk 5, Track 1: *Folding and Unfolding* **Alan Questel**, Pregnant Pauses. Disk 4: *Gentle fingers and gentle threads*
11	Initiating movement from the pelvis	Central initiation INITIATION	ATM 11: Floor to chair - pelvic rock	Sacrum and pubic bone - rocker like shape	Length of spine Which part of rocker	**Mark Reese and David Zemach-Bersin,** Relaxercise,

					contacts the floor?.	Disk 2, track 2: *Lengthening the Spine*
12	Wrap up		ATM 12: Floor - rolling crossed legs to crossed arms	Tibia, fibula	Tibia, fibula	**Cliff Smyth,** Easy Hands and Arms, Volume 2, Lesson 7: *Shoulder and hip circles* **Alan Questel**, Pregnant Pauses Disk 6: *A new way of rolling*

Phase I ATMs

A brief outline of each ATM is provided below.

1. From floor - rolling forward and back on right side

This involves a simple movement of rolling back and forward from side lying. I started with this because it is an undifferentiated movement (where all parts of the body move together) that requires engagement of the torso. Whereas I have found many able-bodied people became quickly bored by this movement, my SCI clients seem to enjoy it. I think this is because the movement of the ribs and pelvis enables them to start sensing the torso, something that they are aware that they have been missing. Helga Bost, a **Feldenkrais** practitioner, writes of how using this strategy helped relieve pain for her client Michael who had an SCI:

> With his pain in mind and in order to deepen his inner sensitivity, I started experimenting with global movements, i.e. everything moves together…Michael was either laying his side or supine, and this new approach quite rapidly changed the nature of his pain, and made the bad tingling almost disappear. He was relaxing to an extent that he kept falling asleep on the spot (Bost, 1997, p. 6).

I use a roller under the leg to take the weight off the leg and enable movement (and thus sensing) of the pelvis.

2. From floor - lateral flexion

I followed with this lesson because lateral flexion (bending sideways) is one of the basic movements of the torso and a good opportunity to pay attention to the ribs.

3. From Floor - flexion

Flexion (bending forward) is another basic movement of torso. It is easy to incorporate the breath so is a good opportunity to introduce the role of the breath in movement.

4. From floor - rolling from back to left side (rolling into flexion) and back

Rolling lessons are good for engaging the muscles of the torso.

5. From floor - rotation

Rotation is another basic movement of torso. The lesson included rotation in side lying and sitting on the floor.

6. From floor - arm circles

This is a lesson incorporating some lateral flexion and rotation and also enables participants to feel the connection of the movement of the arm to the ribs and pelvis. I have personally found this a satisfying pleasurable movement.

7. From chair - reaching left

This expands on the lateral flexion lesson from a sitting position.

8. From floor - extension

This incorporates another basic movement of torso. The lesson involved mainly lifting the head on the stomach so that the back is arched. As part of this lesson I also include some steps where the participants lie prone, arms overhead, elbows bent, looking left. They move the nose to the left, looking under the left shoulder. At the same time they let the left knee soften and bend and the left side of the pelvis lift. I have found that this has been effective at enabling participants to feel the connection between the movement of the head and pelvis.

9. From floor - rolling from left side to front (rolling into extension) and back

This was another rolling lesson and another way for them to move into extension

10. From floor - extension/flexion

This incorporated moving between extension and flexion. It was done from side lying and sitting on the floor so they got to experience the movement from different positions.

11. From chair- extension and flexion, leaning forward

This expands on the previous lesson from a sitting position.

12. From floor - rolling crossed legs to crossed arms

This is a challenging lesson that required a lot of focus. If one focuses on moving the legs and arms it becomes very difficult so it makes it clear to participants that to move the distal parts of oneself, one needs to move the proximal parts of oneself.

Appendix 4.2 Homework ATMs

Alan Questel

Growing Young,

Disk 1, Track 2: *Easy Rolling*

Disk 5, Track 1: *Folding and Unfolding*

Pregnant Pauses

Disk 1: *Easy Rolling*

Disk 2: *Pressing and Lifting*

Disk 4: *Gentle fingers and gentle threads*;

Uncommon Sensing

Disk 1, Track 2: ATM 1: *Shoulderness*

Disk 4, Track 3: ATM 5: *Pressing and Lifting Your Ribs*

Disk 5, Track 1: *Looking and Lifting…For a Surprise*

Disk 6: *A new way of rolling*

The Moment Where We Begin

Disk 4, ATM 6, *Xposition: Pressing/Lifting*

Cliff Smyth

Easy Hands and Arms

Volume 1, Lesson 3. *Moving from shoulders and hips*.

Volume 2, Lesson 7: *Shoulder and hip circles*

Arlyn Zones

A Flexible Chest

Disk 2, track 2: *Circles of the Arm*

Deborah Bowes and Cliff Smyth

The Primary Image

Disk 1, Lesson 2, *Five directions*

Deborah Bowes

Discover Easy Movement and Pain Relief

Lesson 6: *Gentle coordination of your shoulders and hips*

Pelvic Health and Awareness for Women and Men

Disk 1, Track 7, Lesson 1 *Breathing to Relax and Balance the Nervous System,*

Track 8, Lesson 2 *Activating the Right and Left of the Pelvic Floor.*

Disk 2, Lesson 1 *Engaging the Abdominals*

Mark Reese and David Zemach-Bersin

Relaxercise

Disk 1, Track 2: *Learning Easy Flexibility*

Disk 2, Track 2: *Lengthening the Spine*

Disk 4, Track 1: *Aligning the Body*

Appendix 5.1. Information Sheet

School of Health Sciences
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Email: healthsciences@canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Date

Information Sheet
The *Feldenkrais Method*® and Spinal Cord Injuries: Development Stage

Principal investigator:
Cindy Allison, School of Health Sciences, University of Canterbury, phone: 355-2264, 366-7001 ext 8397, e-mail: lucinda.allison@pg.canterbury.ac.nz

Supervisors:
Associate Professor Ray Kirk, School of Health Sciences, University of Canterbury, phone: 364-3108, e-mail: ray.kirk@canterbury.ac.nz

Professor Neville Blampied, Department of Psychology, University of Canterbury, phone: 364-2987 ext 6199, e-mail: neville.blampied@canterbury.ac.nz

Dr Jeffrey Gage, School of Health Sciences, University of Canterbury, phone: 366-7001 ext 7403, e-mail: jeffrey.gage@canterbury.ac.nz

Advisers:
Dr Larry Goldfarb, **Feldenkrais** Trainer, USA
Dr Jim Stephens, **Feldenkrais** Practitioner, USA

You are invited to take part in the research study **The Feldenkrais Method® and Spinal Cord Injuries: Development Stage.** This information sheet will explain why this study is being done and what will be required of participants and should help you to decide whether or not you wish to take part in this study.

Please take your time to read this information sheet carefully. Contact the researcher, Cindy Allison, within one week if you would like to participate, or if you would like more information about the project. If you decide to participate, we will be very grateful for the valuable contribution you will be making to the research project. If you decide not to participate, there will be no disadvantage to you.

About the study

What is the aim of this study?

The aim of this study is to develop a **Feldenkrais** programme designed to improve postural stability and ease of movement in people with spinal cord injury (SCI).

What is the Feldenkrais Method®?

The **Feldenkrais** Method is a way of learning to move with ease and efficiency. For more information visit www.neuroplasticity.co.nz and/or www.feldenkrais.org.nz .

Who can take part in this study?

Participants will be a group of adult volunteers with SCI who meet the following criteria.

- They will use wheelchairs.
- They will be capable of getting on and off the floor.
- They will be over the age of 18.
- They will be able to communicate effectively and understand instructions.
- They would have had the SCI for at least 12 months.

How many participants will be involved?

There will be up to five participants in this phase of the study.

Why is this study taking place?

This study is being carried out as a requirement for a PhD in Health Sciences by Cindy Allison under the supervision of Associate Professor Ray Kirk, Professor Neville Blampied and Dr Jeffrey Gage.

Who pays for the research?

The study is financed by the University of Canterbury.

What's involved

What would your involvement be?

Your involvement in this study will be to:

- take part in a preliminary interview of approximately (1 hour)
- attend a 12 week Feldenkrais group programme (1½ to 2 hours/week)
- provide feedback on how you find the programme. 15 minutes will be set aside at the end of each class and 30 minutes at the end of the programme to enable time for feedback. Further feedback can be provided throughout the programme, or via e-mail or telephone.

Where and when will the study take place?

The interview will take place at a time and venue convenient to you. This could be at the University of Canterbury; the Allan Bean Centre, Burwood Hospital; your home or another venue of your choice.

The 12 week programme will take place at the School of Health Sciences, Waimari Building, College of Education, University of Canterbury, Dovedale Ave. Ph: 366-7001 ext. 8691. Disabled facilities will include a disabled toilet and disabled visitor parking spaces.

What should you wear?

You would need to wear loose comfortable clothes (no skirts or belt buckles) which enable you to move easily. You would not be working up a sweat as in an exercise programme so you would need to ensure that the clothes were warm.

Can I bring friends or Whanau support with me?
You are welcome to bring any support you may need. I suggest you let us know if you intend to bring anyone along so that we can be sure to accommodate them.

What information will be collected?
In the initial interview, the researcher wants to discuss with you any concerns or special needs that you may have. This will help her to shape the draft programme and ensure that your individual needs are met. During this interview she will take hand written notes.

During the 12 week **Feldenkrais** programme she will be collecting information on issues such as how difficult you are finding the movements, how clear the instructions are, whether your individual needs are being met in a group this size and how interesting and relevant you find the material. If all participants consent, the programme will be videoed

Participant rights

Are you obliged to take part?
Your participation is entirely voluntary (your choice). You do not have to take part in the study and if you choose not to take part you will receive the standard care available. You also do not have to answer all the questions asked of you and may stop interviews at any time.

What if you want to withdraw?
You have the right to withdraw from the study at any time without having to give a reason and this will in no way affect your future health care. You also have the right to withdraw any information you have provided up to the point where the results are analysed and the project is written up.

Where can I get more information about my rights?
If you have any queries or concerns regarding your rights as a participant in this study, you may wish to contact an independent health and disability advocate:
Free phone: 0800 555 050
Free fax: 0800 2 SUPPORT (0800 2787 7678)
Email: advocacy@hdc.org.nz

Who do I contact if I have any concerns about this research?
If you have concerns about this research, contact:
Lindsey MacDonald
Chair, Human Ethics Committee
University of Canterbury
E-mail: human-ethics@canterbury.ac.nz

Benefits

What are potential benefits of the study?
This study has the potential to provide you with tools to reduce pain, spasticity and fatigue and to improve postural stability and ease of movement. It also gives you the opportunity to have input into the development of a programme for people with spinal cord injury.

What kind of compensation will you receive for taking part?
If you decide to participate, your travel costs will be reimbursed. In addition, you will be taking part in the programme free of charge.

Will you be able to continue with Feldenkrais once the study has been completed?

If you wish to continue with **Feldenkrais** once the study has been completed you can contact either the researcher or other **Feldenkrais** practitioners. A list of local **Feldenkrais** practitioners is available on www.feldenkrais.org.nz.

Risks and safety

Are there any risks of injury?

In taking part in this study there is minimal risk of injury. This study involves doing some gentle movement. However, these classes are safer than traditional exercise, sports or dance classes for a number of reasons.

- Unlike in most forms of physical activity, participants are encouraged to stay well within their comfort zone. You will never be asked to do any movement that you are not comfortable with.
- The focus is on increasing awareness of how you move, rather than pushing yourself to the limit.
- **Feldenkrais** practitioners are trained to notice when participants are overworking and to encourage them to do less.
- There is no use of force as in stretching and strengthening classes and in most sports. The classes are done either in lying or sitting in a chair, so there is a minimal risk of falling.
- There is no physical contact between participants.
- The preliminary interview will give you a chance to discuss any special needs you may have.

The researcher is a Certified **Feldenkrais** practitioner and a member of the New Zealand **Feldenkrais** Guild. The New Zealand **Feldenkrais** Guild governs the ethics and standards of practice in New Zealand. The researcher is also a Preferred Practitioner at the Burwood Spinal Unit and knows of no instances where an individual has been injured doing **Feldenkrais.**

What if there is a problem?

If a medical problem or any other problem emerges during the course of the interview or programme, the researcher will offer to arrange appropriate assistance or contact the relevant person if needed.

What compensation will be available if there are any ill effects from the programme?

In the unlikely event of a physical injury as a result of your participation in this study, you may be covered by ACC under the Injury Prevention, Rehabilitation, and Compensation Act 2001.

Confidentiality

What will happen to the information collected?

The information collected will be used to develop and refine a postural control programme. Changes made in response to your feedback will be documented.

Every participant will be given a study number; no names will be used. All the information will be kept at the School of Health Sciences at the University of Canterbury. Only the researcher and three supervisors will have access to it to enable the information to be analysed.

Audio and video recordings and other documents will be stored in a locked cabinet in the researcher's office at the School of Health Sciences. Data will be stored on the researcher's password protected computer. If everyone in the group consents, participants will have access to copies of the video recordings of the programme during the study.

At the end of the study the data will be kept securely by the School of Health Sciences for 10 years. After 10 years, the data will be destroyed.

The results of the study may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: the identity of participants will not be made public without their consent. Your participation and any comments you make will remain confidential.

Results

Will you receive the results of the study?

Please be aware that there will be a delay between the data collection and the publication of the results. It is expected that the final writing of the research will be completed by the beginning of 2019. You will receive a copy of the summary of the final report if you wish. Alternatively, you may prefer to discuss the outcomes of the research on an individual basis. If so, you can make an appointment with the researcher.

Statement of approval

Who has reviewed the study?

This study has received ethical approval from the University of Canterbury Human Ethics Committee (HEC2011/113) and the Upper South Health and Disability Ethics Committee (URA/11/10/057).

Further information

Where can you I get more information about the study?

You can request more detailed information about the study from:

- Cindy Allison, School of Health Sciences, University of Canterbury, phone: 355-2264, 3667001 ext 8397, e-mail: lucinda.allison@pg.canterbury.ac.nz
- Associate Professor Ray Kirk, School of Health Sciences, University of Canterbury, phone: 364-3108, e-mail: ray.kirk@canterbury.ac.nz
- Professor Neville Blampied, Department of Psychology, University of Canterbury, phone: 364-2987 ext 6199, e-mail: neville.blampied@canterbury.ac.nz
- Dr Jeffrey Gage, School of Health Sciences, University of Canterbury, phone: 366-7001 ext 7403, e-mail: jeffrey.gage@canterbury.ac.nz

Thank you for considering taking part. Please feel free to contact the researcher if you have any questions about this study.

Appendix 5.2. Consent form

School of Health Sciences
University of Canterbury
Private Bag 4800
Christchurch 8140

Tel: +64 3 366 7001 ext 8397
Email: lucinda.allison@pg.canterbury.ac.nz

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Consent Form
The Feldenkrais® Method and Spinal Cord Injuries: Development Stage

Please tick to confirm.

☐ I have read and understood the description of the above-named study as laid out in the attached information sheet dated _____.

☐ I have had the opportunity to use whānau support or a friend to help me ask questions and understand the study.

☐ I have had the opportunity to discuss this study and am satisfied with any answers I have been given.

☐ I understand that taking part in this study is voluntary (my choice), that I may withdraw from the study at any time (including withdrawal of any information I have provided up to the point where the results are analysed and the project is written up) and that this will in no way affect my future health care.

☐ I understand that my participation in the study will be stopped if it should appear harmful to me.

☐ I understand the compensation provisions for this study.

☐ I know who to contact if I have any concerns in regard to participating in this study.

☐ I know who to contact if I have any questions about the study.

☐ I understand that my participation in this study is confidential and that no material that could identify me will be used in any reports on this study.

☐ I consent to my interview being audiotaped.

☐ I consent to the programme being videotaped.

☐ I consent to other participants of the programme having access to the videotapes.

☐ I consent to publication of the results of the study with the understanding that confidentiality will be preserved.

☐ I understand that a PhD is a public document available via the University of Canterbury library database.

☐ I note that the study has received ethical approval from the University of Canterbury Human Ethics Committee and the Upper South Health and Disability Ethics Committee.

☐ I have had time to consider whether to take part in the study.

I wish to receive a summary of the study's results: Yes / No

I _____ (please print full name) consent to take part in the above research study.

Signature:_____

Date: _____

This study is being conducted by Cindy Allison, PhD student, School of Health Sciences, University of Canterbury, phone: 355-2264, 366-7001 ext 8397, e-mail: lucinda.allison@pg.canterbury.ac.nz

This study is supervised by:

- Associate Professor Ray Kirk, School of Health Sciences, University of Canterbury, phone: 364-3108, e-mail: ray.kirk@canterbury.ac.nz
- Professor Neville Blampied, Department of Psychology, University of Canterbury, phone: 364-2987 ext 6199, e-mail: neville.blampied@canterbury.ac.nz
- Dr Jeffrey Gage, School of Health Sciences, University of Canterbury, phone: 366-7001 ext 7403, e-mail: jeffrey.gage@canterbury.ac.nz

You can contact Cindy or her supervisors if you have any questions or wish to discuss your participation.

Appendix 5.3. Participant details form

School of Health Sciences
University of Canterbury
Private Bag 4800
Christchurch 8140

Tel: +64 3 366 7001 ext8397
Email: lucinda.allison@pg.canterbury.ac.nz

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Participant Details

The Impact of a Feldenkrais® Postural Control Programme on Pain, Spasticity and Fatigue in Spinal Cord Injury

Date: _____

Personal details

Surname: _____ First name: _____

Date of birth: _____ Gender: _____

Ethnicity (tick one of the following):

☐ New Zealand European

☐ Mäori

☐ Pacific Islander

☐ Other, please specify_____

Contact details

Home ph:_____ Work ph:_____

Mobile ph: _____

E-mail address:_____

Employment details

Occupation:_____

Current employment status (tick one or more of the following):

☐ Full time employment (> 30 hours per week)

☐ Part-time employment

☐ Student

☐ Beneficiary

☐ Other, please specify_____

Educational details

Highest qualification? (tick one of the following)

☐ none

☐ NZ School Certificate, National Certificate level 1 or NCEA level 1

☐ NZ Sixth Form Certificate, National Certificate level 2 or NZ University Entrance

☐ NZ Higher School Certificate, Higher Leaving Certificate, NZ University Bursary/Scholarship, National Certificate level 3, NCEA level 3 or NZ Scholarship level 4

☐ University/Polytechnic, please specify qualification

_____

☐ Other, please specify_____

Spinal cord Injury details

Diagnosis: _____ Year of injury: _____

Cause of injury:_____

_____

_____

Exercise habits

Do you exercise? Yes/No

If yes, tick one or more of the following:

☐ Sport, please specify what sport

☐ Aerobics

☐ Gym

☐ Pilates

☐ Yoga

☐ Cycling

☐ Tai Chi

☐ Swimming

☐ Other, please specify_____

How often do you exercise? _____

Relaxation strategies

Do you use relaxation strategies? Yes/No

If yes, choose from the options below:

☐ Meditation

☐ Visualisation

☐ Biofeedback

☐ Autogenics

☐ Yoga

☐ Tai Chi

☐ Other, please specify_____

How often do you use relaxation strategies? _____

Appendix 5.4 Revised programme overview

The tables below provide an overview of the revised programme.

Wk	**Lessons**	**Attribute of optimal movement & SPIFFER**	**ATM**	**Related functions**	**Group explorations**	**Skeletal Focus**
1	Introduction Introduce Acture ***Pay attention to the background*** How can you change what you do if you don't know what you're doing Foreground versus background		Floor - rolling forward and back on right side			Oval shape of torso, how this moves when we move the head and limbs
2	***Do less than you can*** Effort Using imagination	EFFORT	Floor - lateral flexion	Activities involving bending/reaching sideways, e.g., switching on light, applying wheelchair brake, moving from side sitting to lying		Ribs and how they open on one side, close on the other
3	***Find the path of least resistance*** Letting go of old habits and finding easier ways of doing everyday movements. Reducing spasticity	Transmission	Floor - rolling from back to left side (rolling into flexion) and back	Lying on the floor, going to bed rolling over in bed 1		Pelvis, hip joints and how upper legs and pelvis move in relation to each other.

4	***Breathe*** The influence of breath on movement	Respiration BREATHING	Floor - flexion	Bending down to take off shoes, wheeling your chair 1[8]	Begin exploring strategies for getting onto the floor[9]	Ribs, how they move in flexion, diaphragm
5	***Let the big muscles do the work*** Coordinating the torso with the head and limbs	Co-ordinated action	Floor - extension	Reaching up to get an object off a high shelf, wheeling your chair 2[10]	Begin exploring strategies for getting off the floor. Continue exploring strategies for getting onto the floor	Spine and changing size of body of vertebrae. How do they think ribs respond?
6	***Move from your centre*** Initiating movement from the pelvis	Central initiation INITIATION	Chair - pelvic rock	Wheeling your wheelchair, balance in standing[11]	Explore strategies for wheeling chair	Pelvis and sitting bones - rocker like shape
7	***Rest and consolidate*** Break over school holidays	A time to consolidate - review CDs, homework, functions				
8	***Use gravity*** Organising yourself over your sitting bones	Dynamic foundation FOUNDATION	Chair - reaching left in sitting	Reaching for an object (e.g. when cooking), putting your wheelchair in your car 1[12]		Change of weight under sitting bones, feet
9	***Spread the load*** Overuse; distribution of work	Distribution SEQUENCE	Floor - rotation	Putting your wheelchair in your car 2	Continue exploring strategies for getting on and off the floor	How would relationship between shoulder and hips change as you put wheelchair in car?

[8] Reaching for your wheelchair wheel (before pushing it back)
[9] Because getting on and off the floor is difficult for them, they will do this only once in each lesson
[10] Pushing the wheel back
[11] For anyone not using a wheelchair
[12] To perform this function they pick up a wheelchair and rotate to put it in the back seat of their car

10	***Feel the flow***	Smooth flow FLOW	Floor - arm circles	Putting your wheelchair in your car 3		Shoulder, how the ribs support the shoulder. Radius and ulna and how they rotate.
11	***Know where you're going*** Every part of body moves to support your intention	Congruence PATH	Floor - rolling from left side to front (rolling into extension) and back	Rolling over in bed 1		How would legs roll to support rolling onto front
12	***Find your balance*** Review Acture. Exploring ways of continuing practice	Moveability	Floor - rolling crossed legs to crossed arms	Rolling over in bed 2		What happens to tibia, fibula as you roll? Different directions of movement possible in the lower leg

Wk	Scans	Homework ATMs
1	General body image with focus on torso	**Cindy Allison:** Your Body Image For the really keen: **Alan Questel**, Uncommon Sensing, Disk 1, Track 2: ATM 1: *Shoulderness* **Cliff Smyth**, Easy Hands and Arms, Volume 1, Lesson 3. *Moving from shoulders and hips*.
2	Finding comfort, circling on ribs	**Cindy Allison:** Exploring the Ribs For the really keen: **Alan Questel**, Uncommon Sensing, Disk 4, Track 3: ATM 5: *Pressing and Lifting Your Ribs* **Alan Questel**, The Moment Where We Begin, Disk 4, ATM 6, *Xposition: Pressing/Lifting* **Alan Questel**, Pregnant Pauses, Disk 2: *Pressing and Lifting*
3	Pelvis, hip joints	**Cindy Allison:** Hip Joints For the really keen: **Alan Questel**, Pregnant Pauses Disk 1: *Easy Rolling* **Alan Questel**, Growing Young, Disk 1, Track 2: *Easy Rolling.*
4	Breathing, abdominals	**Cindy Allison:** Breathing Into The Belly For the really keen:

		Deborah Bowes, Pelvic Health and Awareness for Women and Men, Disk 1, Track 8, Lesson 2 *Activating the Right and Left of the Pelvic Floor.* Disk 2, Lesson 1 *Engaging the Abdominals*
5	Vertebrae Are you arched forward or back?	**Cindy Allison:** A Long Spine For the really keen: **Alan Questel**, Uncommon Sensing, Disk 5, Track 1: *Looking and Lifting…For a Surprise*
6	Spine, sacrum and pubic bone Position of sitting bones, hips, shoulders, back. Erectness of spine	**Mark Reese and David Zemach-Bersin,** Relaxercise, Disk 2, track 2: *Lengthening the Spine* For the really keen: **Alan Questel**, Growing Young, Disk 5, Track 1: *Folding and Unfolding* **Alan Questel**, Pregnant Pauses. Disk 4: *Gentle fingers and gentle threads*
7		
8	Sitting bones and weight through sitting bones, feet. Where do they think weight would go?	**Mark Reese and David Zemach-Bersin,** Relaxercise, Disk 4, track 1: *Aligning the Body*
9	Sensing diagonals	**Cindy Allison:** Diagonals from Shoulders to Hips **Mark Reese and David Zemach-Bersin,** Relaxercise, Disk 1, track 2: *Learning Easy Flexibility* For the really keen: **Deborah Bowes**, Discover Easy Movement and Pain Relief, Lesson 6: *Gentle coordination of your shoulders and hips*
10	Orientation of shoulders and arms Propensity to spasm	**Deborah Bowes and Cliff Smyth,** The Primary Image, Disk 1, Lesson 2, *Five directions* For the really keen: **Arlyn Zones**, A Flexible Chest, Disk 2, track 2: *Circles of the Arm* **Cliff Smyth,** Easy Hands and Arms, Volume 2, Lesson 7: *Shoulder and hip circles*
11	Hip joints, legs, skeleton and its connections	Develop your own body scan
12	Tibia, fibula	**Deborah Bowes,** Pelvic Health and Awareness for Women and Men, Disk 1, Track 7, Lesson 1 *Breathing to Relax and Balance the Nervous System* For the really keen: **Alan Questel**, Pregnant Pauses Disk 6: *A new way of rolling*

Modified International Spinal Cord Injury Basic Pain Data Set Subset

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Please answer the following questions by circling one number for each question.

1. In general, how much has pain interfered with your day-to-day activities in the past week?

Not at all						Very much
0	1	2	3	4	5	6

2. In general, how much has pain interfered with your overall mood in the past week?

Not at all						Very much
0	1	2	3	4	5	6

3. In general, how much has pain interfered with your ability to get a good night's sleep in the past week?

Not at all						Very much
0	1	2	3	4	5	6

4. How many different pain problems do you have?

☐ 1 ☐ 4

☐ 2 ☐ 5 or more

☐ 3

5. Please answer each set of questions about your <u>two</u> worst pain problems.

First, please answer these questions about your WORST pain problem.

8a. Location(s) of your WORST pain (check all that apply to your WORST pain problem <u>only</u>):

☐ 1) head

☐ 2) neck and/or shoulders

☐ 3) arms and/or hands

☐ 4) torso (chest, abdomen, pelvis, and/or genitals)

☐ 5) back (upper and/or or lower back)

☐ 6) hips, buttocks, and/or anus

☐ 7) upper leg/thighs

☐ 8) lower legs or feet

8b. Average pain intensity of your WORST pain problem in the past week:

No pain										Pain as bad as you can imagine
0	1	2	3	4	5	6	7	8	9	10

If you only have one pain problem, please check this box. ☐

You are done with the survey. If you have more than one pain problem, please continue.

Now, answer these questions about your SECOND WORST pain problem.

9a. Location(s) of your SECOND WORST pain (check all that apply to your SECOND WORST pain problem only):

☐ 1) head

☐ 2) neck and/or shoulders

☐ 3) arms and/or hands

☐ 4) torso (chest, abdomen, pelvis, and/or genitals)

☐ 5) back (upper and/or or lower back)

☐ 6) hips, buttocks, and/or anus

☐ 7) upper leg/thighs

☐ 8) lower legs or feet

9b. Average pain intensity of your SECOND WORST pain problem in the past week:

No pain										Pain as bad as you can imagine
0	1	2	3	4	5	6	7	8	9	10

Spinal Cord Injury Spasticity Evaluation Tool (SCI-SET)

For each of the following, please choose the answer that best describes how your spasticity symptoms have affected that area of your life **during the past 7 days.** When I talk about "spasticity symptoms", I mean:

a) uncontrolled, involuntary muscle contraction or movement (slow or rapid; short or prolonged),
b) involuntary, repetitive, quick muscle movement (up-and-down; side to side),
c) muscle tightness, and
d) what you might describe as "spasms". Please let me know when a question is not applicable to you.

Extremely problematic	Moderately problematic	Somewhat problematic	No effect	Somewhat helpful	Moderately helpful	Extremely helpful
-3	-2	-1	0	+1	+2	+3

DURING THE **PAST 7 DAYS**, HOW HAVE YOUR SPASTICITY SYMPTOMS AFFECTED:

1.	your showering?	-3	-2	-1	0	+1	+2	+3	N/A
2.	your dressing/undressing?	-3	-2	-1	0	+1	+2	+3	N/A
3.	your transfers (to and from bed, chair, vehicle, etc)?	-3	-2	-1	0	+1	+2	+3	N/A
4.	your sitting position (in your chair, etc)?	-3	-2	-1	0	+1	+2	+3	N/A
5.	the preparation of meals?	-3	-2	-1	0	+1	+2	+3	N/A
6.	eating?	-3	-2	-1	0	+1	+2	+3	N/A
7.	drinking?	-3	-2	-1	0	+1	+2	+3	N/A
8.	your small hand movements (writing, use of computer, etc)?	-3	-2	-1	0	+1	+2	+3	N/A
9.	your ability to perform household chores?	-3	-2	-1	0	+1	+2	+3	N/A
10.	your hobbies/recreational activities?	-3	-2	-1	0	+1	+2	+3	N/A
11.	your enjoyment of social outings?	-3	-2	-1	0	+1	+2	+3	N/A
12.	your ability to stand/weight-bear?	-3	-2	-1	0	+1	+2	+3	N/A
13.	your walking ability?	-3	-2	-1	0	+1	+2	+3	N/A
14.	your stability/balance?	-3	-2	-1	0	+1	+2	+3	N/A
15.	your muscle fatigue?	-3	-2	-1	0	+1	+2	+3	N/A
16.	the flexibility of your joints?	-3	-2	-1	0	+1	+2	+3	N/A
17.	your therapy/exercise routine?	-3	-2	-1	0	+1	+2	+3	N/A
18.	your manual wheelchair use?	-3	-2	-1	0	+1	+2	+3	N/A

Extremely problematic	Moderately problematic	Somewhat problematic	No effect	Somewhat helpful	Moderately helpful	Extremely helpful
-3	-2	-1	0	+1	+2	+3

DURING THE **PAST 7 DAYS**, HOW HAVE YOUR SPASTICITY SYMPTOMS AFFECTED:

19. your power wheelchair use?	-3	-2	-1	0	+1	+2	+3	N/A
20. your lying position (in bed, etc)?	-3	-2	-1	0	+1	+2	+3	N/A
21. your ability to change positions in bed?	-3	-2	-1	0	+1	+2	+3	N/A
22. your ability to get to sleep?	-3	-2	-1	0	+1	+2	+3	N/A
23. the quality of your sleep?	-3	-2	-1	0	+1	+2	+3	N/A
24. your sex life?	-3	-2	-1	0	+1	+2	+3	N/A
25. the feeling of being annoyed?	-3	-2	-1	0	+1	+2	+3	N/A
26. the feeling of being embarrassed?	-3	-2	-1	0	+1	+2	+3	N/A
27. your feeling of comfort socially?	-3	-2	-1	0	+1	+2	+3	N/A
28. your feeling of comfort physically?	-3	-2	-1	0	+1	+2	+3	N/A
29. your pain?	-3	-2	-1	0	+1	+2	+3	N/A
30. your concern with falling?	-3	-2	-1	0	+1	+2	+3	N/A
31. your concern with getting injured?	-3	-2	-1	0	+1	+2	+3	N/A
32. your concern with accidentally injuring someone else?	-3	-2	-1	0	+1	+2	+3	N/A
33. your ability to concentrate?	-3	-2	-1	0	+1	+2	+3	N/A
34. your feelings of control over your body?	-3	-2	-1	0	+1	+2	+3	N/A
35. your need to ask for help?	-3	-2	-1	0	+1	+2	+3	N/A

Number of (+) items:	Negative score:
Number of (-) items:	Positive score:
Number of (0) items:	**Total score:**
	Applicable items (#)
	Average score:

Modified Fatigue Severity Scale

Please circle the number between 1 and 7 which you feel best fits the following statements. This refers to your usual way of life within the last week. 1 indicates "strongly disagree" and 7 indicates "strongly agree."

1. I am easily fatigued.

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

2. Fatigue interferes with my physical functioning.

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

3. Fatigue causes frequent problems for me.

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

4. My fatigue prevents sustained physical functioning.

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

5. Fatigue interferes with carrying out certain duties and responsibilities.

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

6. Fatigue is among my three most disabling symptoms.

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

7. Fatigue interferes with my work, family, or social life.

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

The Revised Illness Perception Questionnaire (IPQ-R): Personal Control Subscale

Please indicate how much you agree or disagree with the following statements by ticking the appropriate box.

1. There is a lot which I can do to control my symptoms

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

2. What I do can determine whether my symptoms gets better or worse

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

3. How my symptoms change over time depends on me

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

4. Nothing I do will affect my symptoms

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

5. I have the power to influence my symptoms

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

6. My actions will have no effect on my symptoms

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

Thank you for completing this survey

Appendix 6.2: Phase 3 Perceived Exertion Tests

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Perceived exertion - function tests
Please rate the exertion involved in performing the following functions using the Borg Rating of Perceived Exertion (RPE) Scale below. Ratings range from 6 (no exertion at all) to 20 (maximal exertion).

Name:

_____

Date: _____Time:_____

Activity	Rating
Bending forward to take off your shoes	
Getting onto the floor	
Rolling onto your back	
Rolling onto your left side	
Getting into your chair from the floor	
Reaching up as if to get an object from a high shelf (use the same activity each time you do this test)	
Wheeling your chair (if applicable)	
Standing (if applicable)	
Walking (if applicable)	
Rotating as if to put your wheelchair in your car	
Rolling over in bed	

Perceived Exertion - movement tests
Please rate the exertion involved in performing the following movements using the Borg Rating of Perceived Exertion (RPE) Scale below. Ratings range from 6 (no exertion at all) to 20 (maximal exertion).

This test should be completed twice per week (on Wednesday and Saturday) at the same time (or close to the same time) each time during the four weeks of baseline, then weekly till the end of the study. Do not hold onto the chair will doing these tests.

Name: _____

Date: _____Time:_____

Activity	Rating
Side bend right to touch the floor and come up again	
Bend forward to touch the floor with your left hand and come up again	
Reach up with right hand to point to the ceiling (looking at hand)	
Rotate to touch the top rim of the left wheel with the right hand	
Raise left arm to shoulder height and hold for 5 seconds	
Transfer weight to left buttock and hold for 5 seconds	
Transfer weight to right buttock and hold for 5 seconds	

Borg Rating of Perceived Exertion (RPE) Scale
Copied with permission from Gunnar Borg. The scale with correct instructions can be obtained from Borg Perception, see the homepage www.borgperception.se/index.html

6	No exertion at all
7	Extremely light
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard (heavy)
16	
17	Very hard
18	
19	Extremely hard
20	Maximal exertion

Borg-RPE-skalan®
© Gunnar Borg, 1970, 1985, 1994, 1998

Appendix 6.3: Phase 3 Qualitative Evaluation

Feedback questions and Interviews

Preliminary Interview

1. "What you know about the **Feldenkrais Method**?"
2. "What do you hope to get out of the programme?"
3. "Do you have any special needs that I should be aware of?"
4. Getting off floor?
5. Transport
6. "As part of the programme you will be provided with PDF and MP3 files online. These files contain lessons for you to do for homework. Is this an appropriate format for you to receive those files? Alternatively - by DVD, by pen drive, paper copies, any other option?

Body awareness test

"Imagine that you are about to reach to pick up a cup of coffee from a table to your right. Reach right. What parts of yourself do you feel are involved in the movement? Colour these parts in the body diagrams"

Weekly feedback questions

Have you noticed any changes since last week?

Have you noticed any changes as a result of today's lesson?

Follow-up interview

Body awareness test

- "Imagine that you are about to reach to pick up a cup of coffee from a table to your right. Reach right. What parts of yourself do you feel are involved in the movement? Colour these parts in the body diagrams."

Questions:

Effect of lessons

- What effect have these classes had on your life?
- Has participation in the programme influenced your ability to manage pain, spasticity, fatigue, ease of movement?
    - Review individual quantitative results. Do these reflect your experience?
    - Did you feel that the questions in the questionnaires were appropriate for your situation?
    - Do you believe that continuing to use what you have learnt in the programme could influence pain, spasticity, fatigue, ease of movement?
- Are there any other ways in which what you have learnt on the programme can improve your quality of life
- Any other comments on the effect of the programme?

Learning

- How do you account for any improvements (in reach, ease of movement)?
- Have you had any insights about your own movement as result of the programme?
- Is there anything else that you have you learned on this programme?
- Any other comments on your learning?

Maintenance

- Have you maintained any changes from the classes?
- Have you continued using the skills you were taught on the programme? How?
- Any other comments on maintenance?

The future

- Do you think you will continue to use the **Feldenkrais** Method in the future? How?

Barriers

- What have been the barriers to your participation in the programme?
- What would make it easier for you to access programme?
- Any other comments on barriers?

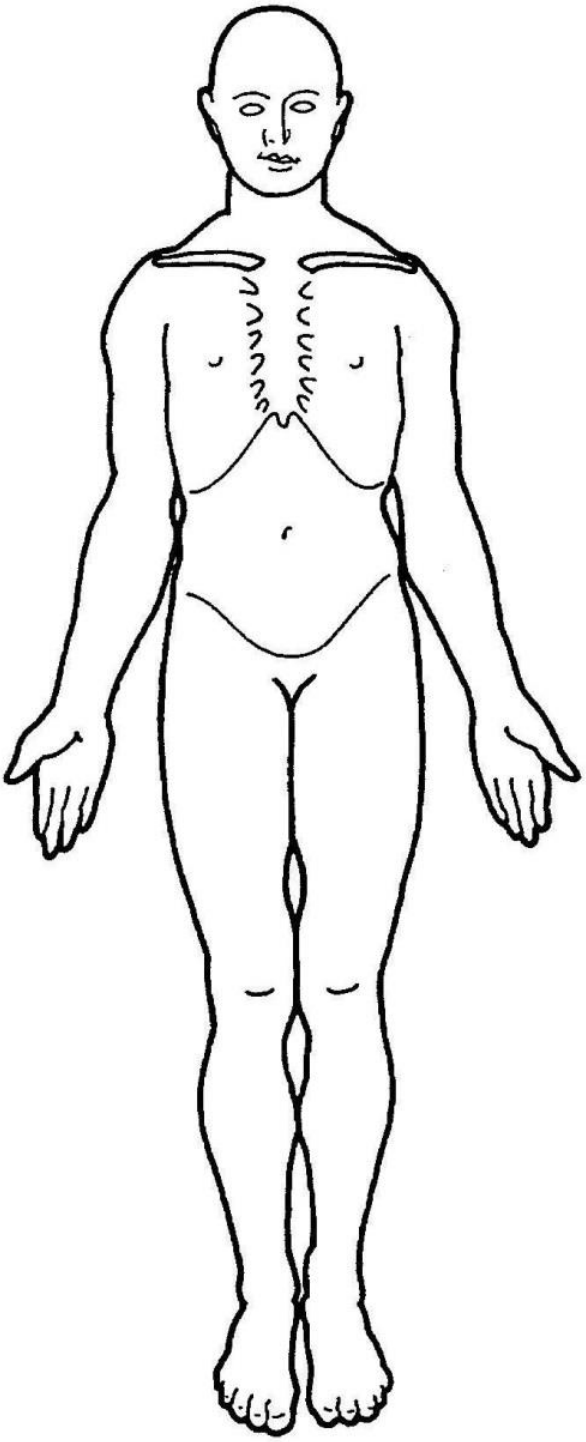
The homework

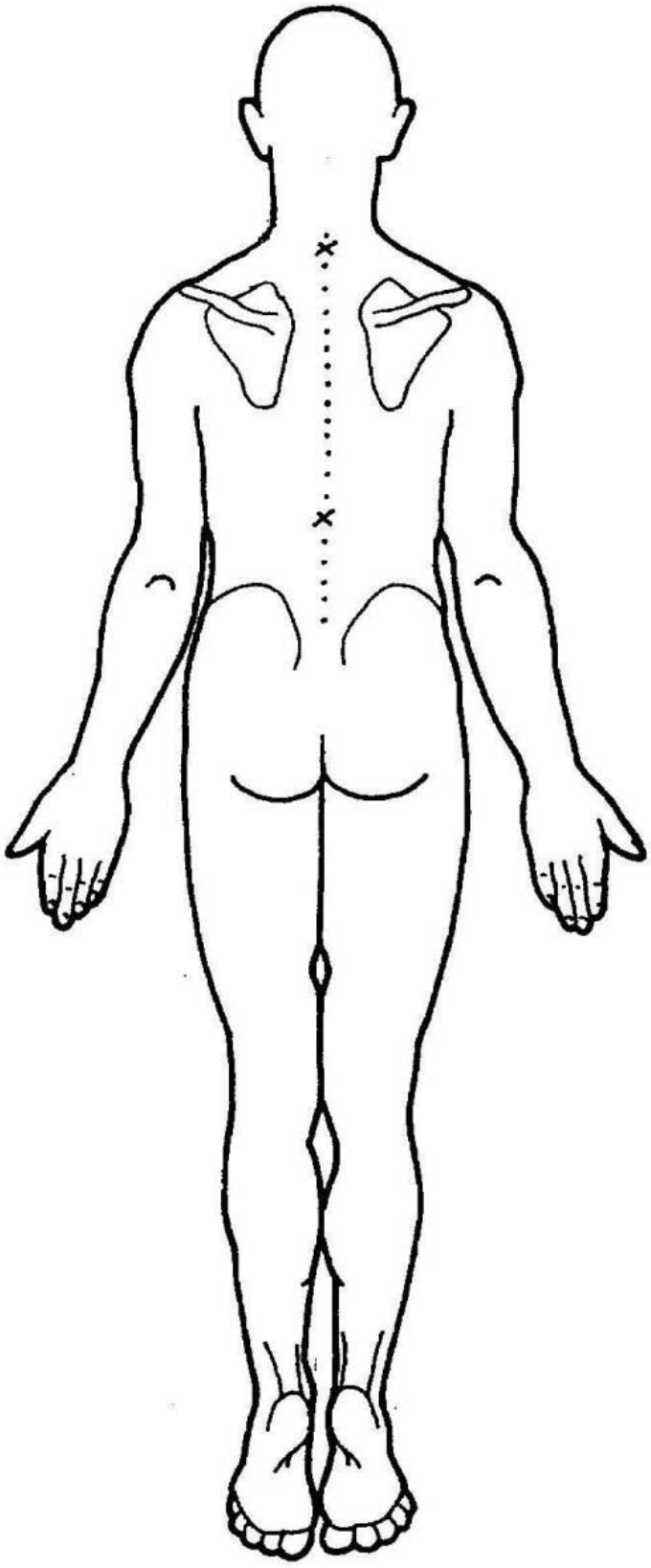
- How useful was the homework?
- What were the barriers to doing homework? What could make it easier?

General

- Do you have any general comments or questions about the programme?

Body Diagrams





Appendix 6.4 Phase 3 Information Sheet

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Christchurch 8140

Tel: +64 3 366 7001
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Date

Information Sheet
The *Feldenkrais Method*® and Spinal Cord Injuries: Phase 3

Principal investigator:
Cindy Allison, School of Health Sciences, University of Canterbury, phone: 366-7001 ext 8397, e-mail: lucinda.allison@pg.canterbury.ac.nz

Supervisors:
Professor Ray Kirk, School of Health Sciences, University of Canterbury, phone: 364-3108, e-mail: ray.kirk@canterbury.ac.nz

Professor Neville Blampied, Department of Psychology, University of Canterbury, phone: 364-2987 ext 6199, e-mail: neville.blampied@canterbury.ac.nz

Advisers:
Dr Larry Goldfarb, **Feldenkrais** Trainer, USA
Dr Jim Stephens, **Feldenkrais** Practitioner, USA

You are invited to take part in the research study **The Feldenkrais Method® and Spinal Cord Injuries: Phase 3.** This information sheet will explain why this study is being done and what will be required of participants and should help you to decide whether or not you wish to take part in this study.

Please take your time to read this information sheet carefully. Contact the researcher, Cindy Allison, within one week if you would like to participate, or if you would like more information about the project. If you decide to participate, we will be very grateful for the valuable contribution you will be making to the research project. If you decide not to participate, there will be no disadvantage to you.

About the study

What is the aim of this study?

The aim of this study is to evaluate the impact of a **Feldenkrais** postural control programme on pain, spasticity, fatigue, ease of movement and postural stability.

What is the Feldenkrais Method?

The **Feldenkrais** Method is a way of learning to move with ease and efficiency. For more information visit www.neuroplasticity.co.nz and/or www.feldenkrais.org.nz .

Who can take part in this study?

Participants will be a group of adult volunteers with SCI who meet the following criteria.

- They will be capable of getting on and off the floor unassisted.
- They will be over the age of 18.
- They will be able to communicate effectively and understand instructions.
- Pain, spasticity and/or fatigue will be interfering with their quality of life.

How many participants will be involved?

There will be up to five participants.

Why is this study taking place?

This study is being carried out as a requirement for a PhD in Health Sciences by Cindy Allison under the supervision of Professor Ray Kirk and Professor Neville Blampied.

Who pays for the research?

The study is financed by the University of Canterbury.

What's involved

What would your involvement be?

Your involvement in this study will be to:

1. take part in a preliminary interview (up to 1.5 hours)
2. attend a 12 week **Feldenkrais** group programme (1½ to 2 hours/week with a one week break in the middle)
3. monitor your ease of movement (20 minutes/week over 4 weeks, 10 minutes/week over 18 weeks)
4. complete questionnaires on symptoms (15 to 20 minutes, 5 times throughout the study)
5. take part in a stability test and ease of function tests (5 times throughout the study)
6. take part in a post-intervention interview (1 hour) and a six week follow-up interview (1 hour).

Copies of the questionnaires, the evaluation schedule and a description of the stability test are attached.

Where and when will the study take place?
The interviews will take place at the University of Canterbury at a time convenient to you. You can complete the questionnaires at home.

The 12 week programme will take place at the School of Health Sciences, Waimari Building, College of Education, University of Canterbury, Dovedale Ave. Ph: 366-7001 ext. 44037. Disabled facilities will include a disabled toilet and disabled visitor parking spaces.

What should you wear?
You would need to wear loose comfortable clothes (no skirts) which enable you to move easily. You would not be working up a sweat as in an exercise programme so you would need to ensure that the clothes were warm.

Can I bring friends or Whanau support with me?
You are welcome to bring any support you may need. I suggest you let us know if you intend to bring anyone along so that we can be sure to accommodate them.

What information will be collected?
In the initial interview, the researcher wants to discuss with you any concerns or special needs that you may have. This will help her to ensure that your individual needs are met. During this interview she will take hand written notes.

During the 12 week **Feldenkrais** programme she will be collecting information on how the programme affects your pain, spasticity, fatigue, ease of movement and postural stability. If all participants consent, the programme will be videoed.

Participant rights

Are you obliged to take part?
Your participation is entirely voluntary (your choice). You do not have to take part in the study and if you choose not to take part you will receive the standard care available. You also do not have to answer all the questions asked of you and may stop interviews at any time.

What if you want to withdraw?
You have the right to withdraw from the study at any time without having to give a reason and this will in no way affect your future health care. You also have the right to withdraw any information you have provided up to the point where the results are analysed and the project is written up.

Where can I get more information about my rights?
If you have any queries or concerns regarding your rights as a participant in this study, you may wish to contact an independent health and disability advocate:
Free phone: 0800 555 050
Free fax: 0800 2 SUPPORT (0800 2787 7678)
Email: advocacy@hdc.org.nz

Who do I contact if I have any concerns about this research?
If you have concerns about this research, contact:
Chair, Human Ethics Committee
University of Canterbury
E-mail: human-ethics@canterbury.ac.nz

Benefits

What are potential benefits of the study?
This study has the potential to provide you with tools to reduce pain, spasticity and fatigue and to improve postural stability and ease of movement.

What kind of compensation will you receive?
If you decide to participate, you will receive a $60 travel voucher. In addition, you will be taking part in the programme free of charge.

Will you be able to continue with Feldenkrais once the study has been completed?
If you wish to continue with **Feldenkrais** once the study has been completed you can contact either the researcher or other **Feldenkrais** practitioners. A list of local **Feldenkrais** practitioners is available on www.feldenkrais.org.nz.

Risks and safety

Are there any risks of injury?
In taking part in this study there is minimal risk of injury. This study involves doing some gentle movement. However, these classes are safer than traditional exercise, sports or dance classes for a number of reasons.

- Unlike in most forms of physical activity, participants are encouraged to stay well within their comfort zone. You will never be asked to do any movement that you are not comfortable with.
- The focus is on increasing awareness of how you move, rather than pushing yourself to the limit.
- **Feldenkrais** practitioners are trained to notice when participants are overworking and to encourage them to do less.
- There is no use of force as in stretching and strengthening classes and in most sports. The classes are done either in lying or sitting in a chair, so there is a minimal risk of falling.
- There is no physical contact between participants.
- The preliminary interview will give you a chance to discuss any special needs you may have.

The researcher is a Certified **Feldenkrais** practitioner and a member of the New Zealand **Feldenkrais** Guild. The New Zealand **Feldenkrais** Guild governs the ethics and standards of practice in New Zealand. The researcher is also a Preferred Practitioner at the Burwood Spinal Unit and knows of no instances where an individual has been injured doing **Feldenkrais.**

What if there is a problem?
If a medical problem or any other problem emerges during the course of the interview or programme, the researcher will offer to arrange appropriate assistance or contact the relevant person if needed.

What compensation will be available if there are any ill effects from the programme?
In the unlikely event of a physical injury as a result of your participation in this study, you may be covered by ACC under the Injury Prevention, Rehabilitation, and Compensation Act 2001.

Confidentiality

What will happen to the information collected?
The information collected will be used to assess the effect of a **Feldenkrais** postural control programme on pain, spasticity and fatigue.

Every participant will be given a study number; no names will be used. All the information will be kept at the School of Health Sciences at the University of Canterbury. Only the researcher and three supervisors will have access to it to enable the information to be analysed.

Audio and video recordings and other documents will be stored in a locked cabinet in the researcher's office at the School of Health Sciences. Data will be stored on the researcher's password protected computer. If everyone in the group consents, participants will have access to copies of the video recordings of the programme during the study.

At the end of the study the data will be kept securely by the School of Health Sciences for 10 years. After 10 years, the data will be destroyed.

The results of the study may be published. Research findings will be made available to spinal cord injury networks (e.g. NZ Spinal Trust, ANZ Spinal Cord Injury Network, Burwood Academy of Independent Living, the Catwalk Trust). It will also be made available to health providers and funders such as the New Zealand Spinal Units, the Ministry of Health, the Accident Compensation Commission, published in peer-reviewed academic journals and presented at conferences. However, you may be assured of the complete confidentiality of data gathered in this investigation.

A PhD is a public document via the University of Canterbury library database. However, the identity of participants will not be made public without their consent. Your participation and any comments you make will remain confidential.

Results

Will you receive the results of the study?
Please be aware that there will be a delay between the data collection and the publication of the results. It is expected that the final writing of the research will be completed by the beginning of 2019. You will receive a copy of the summary of the final report if you wish. Alternatively, you may prefer to discuss the outcomes of the research on an individual basis. If so, you can make an appointment with the researcher.

Statement of approval

Who has reviewed the study?
This study has received ethical approval from the University of Canterbury Human Ethics Committee (HEC2011/113) and the Upper South Health and Disability Ethics Committee (URA/11/10/057).

Further information

Where can you I get more information about the study?

You can request more detailed information about the study from:

- Cindy Allison, School of Health Sciences, University of Canterbury, phone: 366 7001 ext 8397, e-mail: lucinda.allison@pg.canterbury.ac.nz

- Professor Ray Kirk, School of Health Sciences, University of Canterbury, phone: 364-3108, e-mail: ray.kirk@canterbury.ac.nz

- Professor Neville Blampied, Head of Department, Department of Psychology, University of Canterbury, phone: 364-2987 ext 6199, e-mail: neville.blampied@canterbury.ac.nz

Thank you for considering taking part. Please feel free to contact the researcher if you have any questions about this study

Appendix 6.5 Phase 3 Consent Form

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CHRISTCHURCH NEW ZEALAND

Consent Form
The Feldenkrais® Method and Spinal Cord Injuries: Phase 3

Please tick to confirm.

☐ I have read and understood the description of the above-named study as laid out in the attached information sheet dated _____.

☐ I have had the opportunity to use whānau support or a friend to help me ask questions and understand the study.

☐ I have had the opportunity to discuss this study and am satisfied with any answers I have been given.

☐ I understand that taking part in this study is voluntary (my choice),that I may withdraw from the study at any time (including withdrawal of any information I have provided up to the point where the results are analysed and the project is written up) and that this will in no way affect my future health care.

☐ I understand that my participation in the study will be stopped if it should appear harmful to me.

☐ I understand the compensation provisions for this study.

☐ I know who to contact if I have any concerns in regard to participating in this study.

☐ I know who to contact if I have any questions about the study.

☐ I understand that my participation in this study is confidential and that no material that could identify me will be used in any reports on this study.

☐ I consent to my interview being audiotaped.

☐ I consent to the programme being videotaped.

☐ I consent to other participants of the programme having access to the videotapes.

☐ I consent to publication of the results of the study with the understanding that confidentiality will be preserved.

☐ I understand that a PhD is a public document available via the University of Canterbury library database.

☐ I note that the study has received ethical approval from the University of Canterbury Human Ethics Committee and the Upper South Health and Disability Ethics Committee.

☐ I have had time to consider whether to take part in the study.

I wish to receive a summary of the study's results: Yes / No

I _____ (please print full name) consent to take part in the above research study.

Signature:_____

Date: _____

This study is being conducted by Cindy Allison, PhD student, School of Health Sciences, University of Canterbury, phone: 366-7001 ext 8397, e-mail: lucinda.allison@pg.canterbury.ac.nz

This project is supervised by:

- Professor Ray Kirk, School of Health Sciences, University of Canterbury, phone: 03-364-3108, e-mail: ray.kirk@canterbury.ac.nz
- Professor Neville Blampied, Department of Psychology, University of Canterbury, phone: 364-2987 ext.6199, e-mail: neville.blampied@canterbury.ac.nz

You can contact Cindy or her supervisors if you have any questions or wish to discuss your participation.

Appendix 6.6 Phase 3 Participant Details Form

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Participant Details
The *Feldenkrais*® Method and Spinal Cord Injuries

Date: _____

Personal details

Surname: _____ First name: _____

Date of birth: _____ Gender: _____

Ethnicity (tick one of the following):

☐ New Zealand European

☐ Mäori

☐ Pacific Islander

☐ Other, please specify_____

Contact details

Home ph:_____ Work ph:_____

Mobile ph: _____

E-mail address:_____

Employment details

Occupation:_____

Current employment status (tick one or more of the following):

☐ Full time employment (> 30 hours per week)

☐ Part-time employment

☐ Student

☐ Beneficiary

☐ Other, please specify_____

Educational details

Highest qualification? (tick one of the following)

☐ none

☐ NZ School Certificate, National Certificate level 1 or NCEA level 1

☐ NZ Sixth Form Certificate, National Certificate level 2 or NZ University Entrance

☐ NZ Higher School Certificate, Higher Leaving Certificate, NZ University Bursary/Scholarship, National Certificate level 3, NCEA level 3 or NZ Scholarship level 4

☐ University/Polytechnic, please specify qualification

_____

☐ Other, please specify_____

Spinal cord Injury details

Diagnosis: _____ Year of injury: _____

Cause of injury:_____

_____

Exercise habits

Do you exercise? Yes/No

If yes, tick one or more of the following:

☐ Sport, please specify what sport

☐ Aerobics

☐ Gym

☐ Pilates

☐ Yoga

☐ Cycling

☐ Tai Chi

☐ Swimming

☐ Other, please specify_____
How often do you exercise? _____

Relaxation strategies
Do you use relaxation strategies? Yes/No

If yes, choose from the options below:

☐ Meditation

☐ Visualisation

☐ Biofeedback

☐ Autogenics

☐ Yoga

☐ Tai Chi

☐ Other, please specify_____

How often do you use relaxation strategies? _____